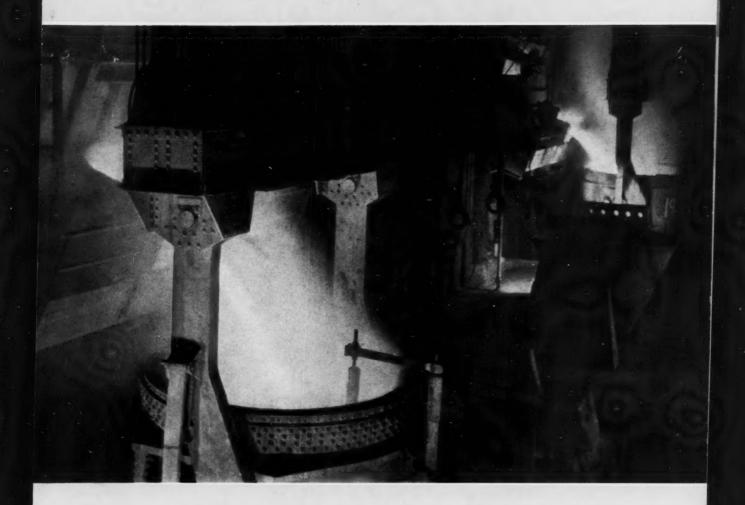
AUTOMOTIVE PRODUCTION NUMBER - NOVEMBER, 1954

MACHINERY



Why we make our own steel

A properly designed tapered roller bearing, by geometrical law, gives true rolling motion and the answer to friction wherever wheels and shafts turn. And it has to conform in manufacture to its geometric ideal. Dimensions and surfaces have to be microscopically correct.

It all starts with the steel from which the bearing is made. It has to be tough enough to take shock loads, hard enough to shrug off wear, have plenty of stamina so it won't get tired—perfect thruand-thru. To get it, we make it ourselves. In the country's largest specialty alloy steel mill. In electric furnaces only. We're the only U. S. bearing manufacturer that takes this extra quality step.

Timken* bearings are designed right, made right, made of the right steel. That's why only Timken bearings roll so true, have such quality thru-and-thru. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "Timrosco".





51/2 BILLION HORSEPOWER ON THE GO!

... your share is a little more dependable, more responsive, because of Heald precision-finished parts like this

Yours is among the more than 45 million passenger cars representing some 5½ billion horsepower in use today—a real tribute to the automotive industry and the precision mass production that has made it possible. There are many Heald machines in this production picture, precision finishing hundreds of different parts. The one shown here is a typical example.

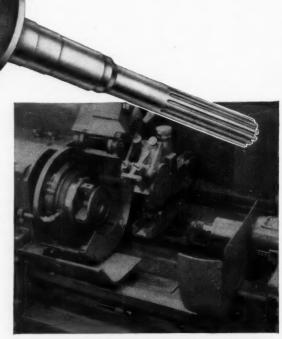
Applied to any job, Heald precision means time and money saved—a finer, longer-lasting product that can stay ahead in the competitive race. That's why IT PAYS TO COME TO HEALD.



MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



The model 271 Size-Matic Internal above precision grinds two different I.D.'s simultaneously in automatic transmission output shafts. Wheelhead spindle carries two wheels of different diameters. Air-operated diaphragm chuck simplifies loading. Entire operating cycle—rough grind, dress, finish grind, size and retract—is fully automatic. Constant feed throttling maintains consistent feed rates regardless of internal or external temperature changes.

MACHINERY
Editorial, Advertising and
Circulation Offices
148 Lafayette St., New York 13, N. Y.

Editor CHARLES O. HERB

Associate Editors
FREEMAN C. DUSTON
CHARLES H. WICK
EDGAR ALTHOLZ

Assistant Editor
RAYMOND H. SPIOTTA

Book Editor HOLBROOK L. HORTON

THE INDUSTRIAL PRESS
Publishers

ROBERT B. LUCHARS
President

EDGAR A. BECKER Vice-President and Treasurer

HAROLD L. GRAY
Secretary and Publishing Manager

Advertising Representatives
WALTER E. ROBINSON
DWIGHT COOK
148 Lafayette St., New York 13, N. Y.

GEORGE H. BUEHLER 228 N. LaSalle St., Chicago 1, III.

NORMAN O. WYNKOOP, Jr. 15937 W. Seven Mile Road Detroit 35, Mich.

DON HARWAY & COMPANY 1709 W. Eighth St., Los Angeles 17, Calif.

MACHINERY, published monthly by The Industrial Press, Emmett St., Bristol, Conn. Executive offices, 148 Lafayette St., New York 13, N.Y.

Subscription Rates: United States and Canada, one year, \$4; two years, \$7; three years, \$8; foreign countries, one year, \$7; two years, \$13. Single copies, 40 cents, except this special number, which is \$1. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address. Copyright 1954 by The Industrial Press.

Entered as second-class mail matter May 25, 1953, at the Post Office at Bristol, Conn., under the Act of March 3, 1879. Printed in the United States of America.

British Address
National House, West St.
Brighton 1, England

French Address 15, Rue Bleue Paris-IX^e, France





MACHINERY

VOLUME 61 NOVEMBER, 1954 NUMBER 3

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

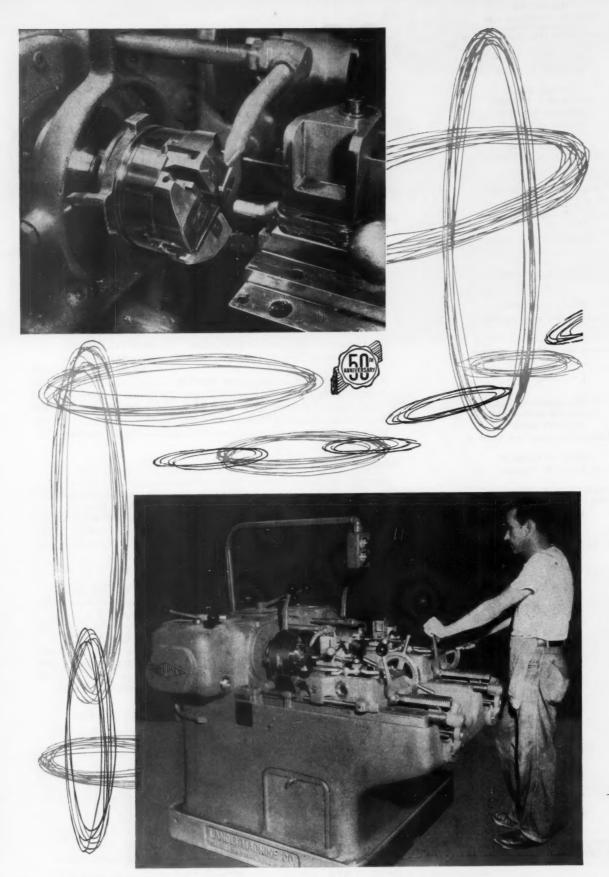
SHOP PRACTICE	SH	OP	PRA	CTI	CE
---------------	----	----	-----	-----	----

Modern Tooling Produces Pontiac's New V-8 Engine	
Ru Buel E. Starr	160
Dodge Finishes Pistons by Turning	170
Assembly Machines Speed Output of Automotive Accessories By Howard L. Roat	178
Ford's New Method of Forming and Machining Chassis Parts By Charles H. Wick	184
Powdered Metal Parts Find Increasing Automotive Applications By D. B. Martin	192
Reo Converts Quickly to V-8 Production By Archie C. Campbell	198
Power Steering Units Require Precision Manufacturing Methods By E. R. Zahnow	206
Automotive Hardware an Atwood Specialty	214
Willys Modernizes Its Forging Facilities . By Joseph H. Pargeter	220
"West-ing-arc" Process Welds Steel with Consumable Electrode .	225
Automation Applied to Bearing Assembly	232
Pressure in Tons per Linear Foot Required for Angle Bending	277
MACHINE AND TOOL DESIGN	
Intermittent Motion Derived from Continuously Rotating Shaft	
By L. Kasper	227
Unidirectional Rotation Regardless of Changes in Drive Direction By Paul Grodzinski	228
Special Chucking Machine Attachments for Milling Under-Cuts .	229
Gage Checks Five Dimensions of Shaft Neck . By W. M. Halliday	231
MANAGEMENT PROBLEMS AND EVENTS	
Productive Capacity and Obsolescence Complicate Defense Program	155
A Memorable Year Ahead for the Automobile Industry	100
By Charles O. Herb Seventieth Anniversary Celebrated by Cincinnati Milling Machine	157
Co	226
Pills of Contentment	233
Highlights of the Machine Tool Distributors' Meeting	286
How Much Does It Cost Not to Know? By Franklin D. Jones	
(Insert between pages 294 and 295)	
DEPARTMENTS	
Keeping up with Washington 155 New Catalogues	265
Ingenious Mechanisms 227 Between Grinds	271
Tool Engineering Ideas 229 News of the Industry	272
The Sales Engineer	277 284
The Latest in Shop Equipment 234 Coming Events	404

Product Directory 318



Advertisers Index 445–446



2-Machinery, November, 1954



FASTER TURNING

Using 4 Cutting Tools







Automotive parts production at Thompson Products in Detroit has been substantially increased by turning, facing, and chamfering on Landis Threading Machines. This LAN-DIS Hollow Milling technique makes large out-put increases possible by applying a number of simultarebusly-functioning cutters, thus multiplying the feed rate of a single tool.

The illustrations show one of these parts, steering links, being turned and faced on a LANDMACO Double-Spindle Leadscrew Threading Machine. SAE 1040 steel forgings are turned (1/32" stock removal) 11/8" in length and faced by four special turning cutters in 7/8" V LANCO Hardened and Ground Heads. Production regularly averages 200 pieces per hour, with the 5/8" turned diameter held within ±.004". Four hours production is obtained between cutter grinds.

This LANDIS technique offers important advantages over other methods of turning, forming, and facing. The use of four or six simultaneously-functioning cutters, in addition to increasing production, reduces tool cost and workpiece spoilage to the minimum. The diametrically-opposing cutters evenly distribute cutting strains and maintain proper work alignment. LANDIS Cutters, available in a wide variety of styles, are economical for they are usable for most of their length with only a simple regrinding of the rake angle.

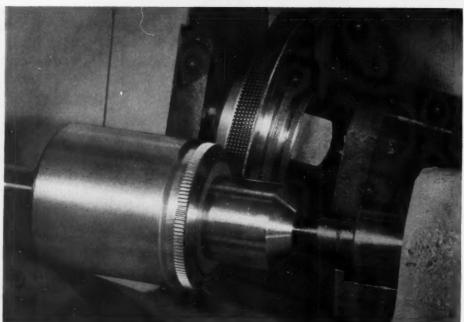
Additional information will be sent on request—please include specifications when writing.

MANUFACTURERS

Machine [0 . PENNS



Finishing on a Fellows No. 4 Fine-Pitch Shaving Machine



THE FELLOWS

ELECTRO-MECHANICAL ACCURACIES TO 6 Minutes of Arc



1/3600 variation in the relative rotative motion between a Ketay Synchro and its paired Servo device involves manufacturing controls and shop skills of a high order. As typical of its gear cutting, Ketay Manufacturing Corporation, 555 Broadway, New York 12, quotes the following 'specs' for the Synchro housing shown:

- 96 teeth, 72 pitch, 1.3333" pitch dia., 20° pressure angle, integral on housing of #303 stainless
- Inspection limits: .0005" on runout, .0002" on pitch diameter
- All cut and shaved on Fellows machines; 'Red Liner' inspected

Ketay, a major supplier of synchros, servo motors, resolvers, and precision electro-mechanical devices to leading manufacturers of automatic controls, relies on Fellows gear cutting to supply plants on the East and West Coast.

Whether fine-pitch gears for electronic instruments, or load carrying gears for machines, precision quality and cost economy are well served by the Fellows Method.

Ask the nearest sales office for specific information.

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.

Branch Offices: 319 Fisher Building, Detroit 2, Michigan • 5835 West North Avenue, Chicago 39, Illinois 2206 Empire State Building, New York 1, N.Y.



PRODUCTION PACKAGE by Cincinnation of the Package by Cincinnat

CINCINNATI No. 5-54 Single Ram Vertical Hydro-Broach, tooled up by Cincinnati Application Engineers to broach the cam profile and clearance on automotive cams.

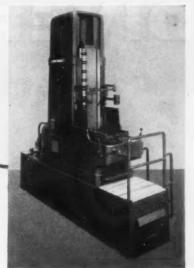


Drawing of the cam broached on the equipment illustrated here. Color line indicates broached surface. Production 970 cams per hour.

All work and no play . . . for the machine . . . must have been the motto in mind when Cincinnati Application Engineers developed the equipment shown here. It's a complete production package, consisting of a Cincinnati No. 5-54 Single Ram Vertical Hydro-Broach with all the necessary tooling. Operation is simplicity itself. The operator merely places four parts (two stacks of two) on the air operated fixture, and the production cycle is automatic. At the top of the stroke a pusher moves the work to the edge of the fixture, where the pieces drop into position on tapered pins and are pneumatically clamped when the ram descends. On the upward stroke, the finished parts are ejected into a chute. The ram cycle proceeds continuously broaching 970 cams per hour. This equipment may give you some ideas in raising production and reducing cost. It is typical of the work handled by Cincinnati Application Engineers. These men are willing to give you the benefit of their many years' experience in tooling up new Hydro-Broach machines. May we hear from you? Please give us complete engineering and production data.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI Single Ram Vertical Hydro-Broach Machine. Seven sizes are available up to 10-ton broaching force, 66" stroke. Write for catalog No. M-1745. Data for larger sizes on request.



CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

. . . FOR

of SMALL PARTS at
HIGH PRODUCTION RATES

THAT CUT COSTS,



Don't wait... for extra profits install a Van Norman machine now! They are available on four purchase plans — Outright sale... Purchase on conditional sales contract up to 5 years... Straight lease... Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

VAN NORMAN

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



This outstanding centerless grinder can help you cut your grinding costs. It provides fine finish to close tolerances at high production rates. Actually three machines in one, the Diversimatic is a standard centerless grinder for throughfeed work . . . a standard centerless grinder for infeed jobs . . . and equipped with the Crush Forming Attachment, it does form grinding not possible by any other method.

The Diversimatic finish grinds small parts from solid . . . or finish grinds rough-turned parts. It grinds faster, holds tolerances, cuts costs.

CENTERLESS GRIND PARTS LIKE THESE FASTER, MORE ECONOMICALLY ON THE DIVERSIMATIC



Get the full facts on the Van Norman Diversimatic Centerless Grinder. See for yourself how this versatile grinder can cut your grinding costs on small shafts, formed shapes, parts of two or more diameters or special contours.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

For more Information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-9

Completely Automatic Operation



LANDIS

precision grinders

Automatic Wheel Dressing

This new Landis No. 12½ Centerless grinder now makes possible reduced grinding costs for work up to 6" diameter. Automatic operation, like this example, can reduce your grinding costs. Send your data for production estimates.

cuts centerless grinding costs

picks valves off conveyor

Output: 1320 valve stems per hour

REGULATING WHEEL

GRINDING WHEEL

Stock Removal: .020" on diameter

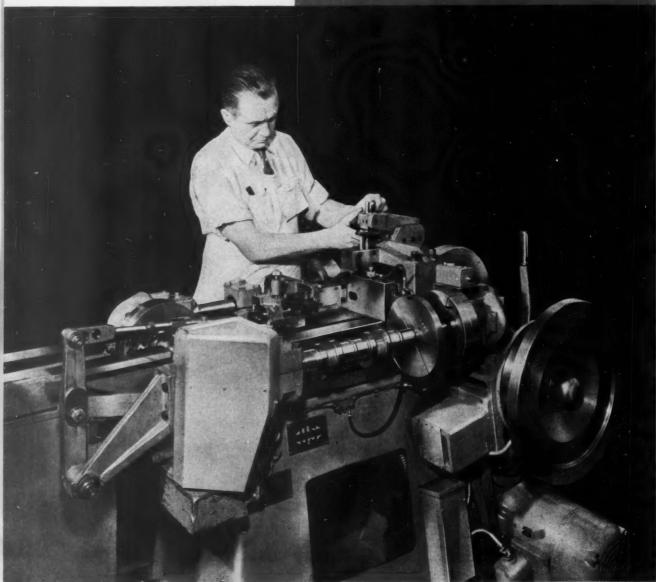
automatically grinds stems to size

discharges valves to conveyor

LANDIS TOOL COMPANY

WAYNESBORO, PENNA., U. S. A.





Top of the bed of a No. 28 U. S. Multi-Slide Machine, with the operator making adjustments to the stock guides. Forming slides and vertical stripper movement, standard equipment on the machine, are shown at right in the photo.





PRODUCE PART LIKE THESE ON THE U. S. MULTI-SLIDE®



All the parts shown above and on the facing page were tooled for production in U. S. Multi-Slide® Machines by the General Tool and Engineering Company, Dayton, Ohio. They illustrate just a few of the many different types of parts which can be produced complete in the U. S. Multi-Slide — without secondary handlings and at profitable high production rates.

The feed unit, ram, forming slides and vertical stripper (which are included as standard equipment) make it possible to produce complete parts of complicated nature to close tolerances at each stroke of the machine. The U. S. Multi-Slide may be tooled up to perform trimming, piercing, shearing, embossing, swaging and forming operations in a great variety of combinations.

You, too, can reduce labor costs, increase production and improve quality by using U. S. Multi-Slides for the production of your precision formed stampings.

Bulletin 15-M contains complete specifications for all four sizes of U. S. Multi-Slide Machines. Ask for a copy.

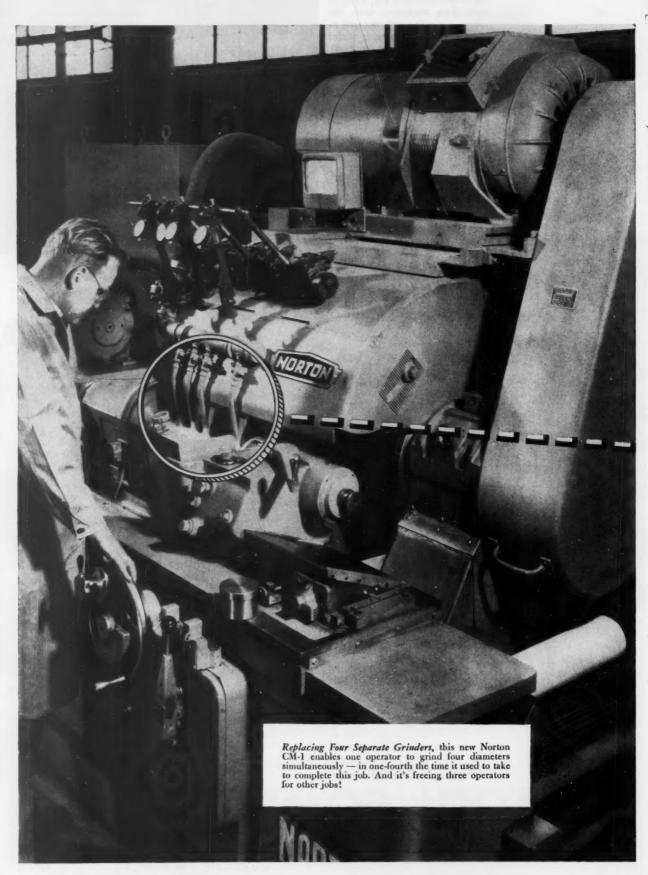
U. S. TOOL COMPANY, Inc.

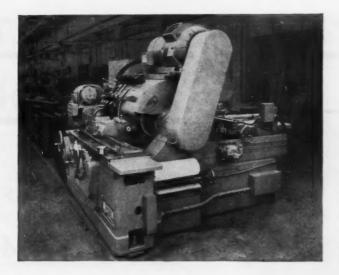
AMPERE (East Orange)

NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories



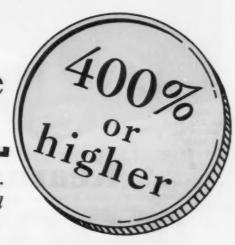


A Great New Production Tool. The Norton Type CM-1 Heavy Duty Semiautomatic Multi-Wheel Grinder brings new efficiency and economy to the grinding of parts having multi-diameters such as crank and camshafts, transmission and motor shafts, etc.

Here's a new Norton Grinder to

boost your production rate

Type CM-1 Heavy Duty Multi-Wheel Grinder does four or more jobs at once, reduces capital investment, cuts operating time and costs



When you can get one machine that does the work of several, in a fraction of the working time, you save considerably on purchase costs, on operating costs, and on floor space.

That machine is now ready to go to work for you. The new Norton CM-1 makes four or more cuts in a single plunge-grind cycle, operating automatically under one-lever control. And it completes each separate grinding operation with the accurate, trouble-free performance that's built into every Norton grinding machine.

Typical Advanced Features

• Cartridge type bearings at each end of heavy, 12"-diameter wheel spindle assure extreme rigidity of spindle, longer wheel life, greater accuracy and control with minimum truing.

- Automatic truing device in rear, out of operator's way — trues straight or formed wheels each individually, yet all at once, thus requiring only the amount of time needed to true widest wheel.
- Automatic compensation for collective wheel wear, including amount trued off.
 No adjustment or resetting of wheel needed after truing.
- Optional equipment includes built in automatic sludge remover and coolant filter, constant peripheral wheel speed control, increased power for wheel or work drive, etc.

Why not get the complete story of how the CM-1 can benefit your grinding operations? See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to bring you the "Touch of Gold"—to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

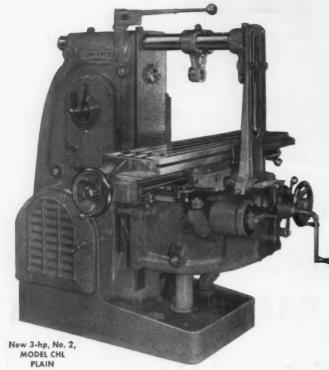


GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: Hartford • New York
• Cleveland • Chicago • Detroit

LESS THAN 23 CENTS PER HOUR



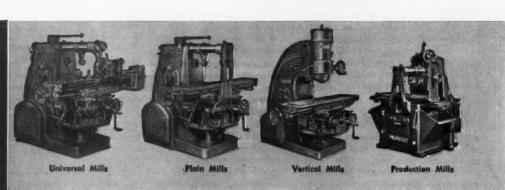
...will put this new 3-hp, No. 2, Model CHL plain milling machine to work in your plant with...

Kearney & Trecker's

TOOTHINASIR

PROGRAM

Kearney & Trecker manufactures a complete line of more than 250 standard knee and bed type milling machines and precision boring machines.



LET'S LOOK AT THE OBSOLESCENCE PICTURE IN THE GENERAL INDUSTRIAL EQUIPMENT INDUSTRY



Here's the picture in a typical industry — GENERAL INDUS-TRIAL EQUIPMENT - (see chart at right). Of the 6032 stand-

ard knee type horizontal, vertical, bed and manufacturing type milling machines and precision boring machines in use today which can be replaced by Tool-Lease equipment - 22% are more than 20 years old, 33% are 10 to 20 years old, 55% are more than 10 years old!

Machines over 20 years old,	-
which should definitely	
be replaced	

605 automatic and manufacturing type milling machines

1310 vertical milling machines

3375 knee type horizontal milling machines

259 bed type milling machines

483 horizontal and vertical precision boring machines

Machines 10-20 years old,	Ì
which should probably	
be replaced	

12:44	34%		49%
24 3	4%		54%
	3	3%	38%
25%	20%		55%
% 33	%	6	4%

HERE'S THE OVERALL PICTURE IN THE ABOVE AND 15 OTHER BASIC INDUSTRIES

Of the 150,825 machine tools in these industries of the types covered by Tool-Lease - 18% are over 20 years old and 38% are from 10-20 years old. A break-down on any of these industries will be furnished upon specific request.

2014	26%	54%
Agricultu	ral equipr	nent
33%	33%	44%
Const., n	nining and	oil well equip
22%	32 %	46%

28%	35 %	37%	
Special in	dustry macl	inery	
22%	33%	45%	
General in	dustrial eq	frenqiu	
215	27%	41 %	
Office and	store mach	ines	

13%	39%	48 %
Domesi	ic and servi	ice equipment
SPS.	39 %	42 %
Electric	at equipmen	19
19%	37%	44%
Misc. n	nachine part	s and jobbing
18%	33 %	49%
Motor	rehicles and	parts
200	38 %	58%
-		

25	51%	47%
Aircraft	engines, pr	opellers & po
TAY	54%	30%
Railroa	d equipment	
145	36%	46%
Fabrical	ed metal pre	ducts
14%	48 %	38%
Shipbuil	lding, ordna	nce and misc.
115	37%	52%
Precisio	n machanism	4

Figures adapted from 1953 American Machinist survey of metalworking industry

No! We didn't make a mistake. Under Tool-Lease Plan "A", one of three seven-year lease agreements offered by Kearney & Trecker, you are asked to make two semi-annual rental payments, totaling 25% of the machine's price during each of the first three years. Actually, in dollars and cents, you are asked to invest approximately 23 cents per hour for a new 3-hp, No. 2, Model CHL plain milling machine. That means a machine installed in your plant and in operation - for pennies an hour!

What's more, under Tool-Lease, you can rent any of over 250 standard milling machines or precision boring machines. All are available under three basic plans, with varying options to continue or terminate the lease, or to purchase the equipment. If you require special machinery or heavy-duty CSM bed types, special agreements will be considered.

GET ALL THE FACTS NOW!

For complete information on Tool-Lease . . . help in analyzing your milling and/or precision boring needs - see your Kearney & Trecker representative or mail coupon to Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.



Rotary Head Milling Machines **Autometric Precision Boring Machines**

KEARNEY & TRECKER CORP. 6784 W. National Avenue Milwaukee 14, Wisconsin

Please send me Bulletin TL-10A on Tool-Lease Program and booklet titled "Critical Picture of Creeping Obsolescence" or call Milwaukee, GReenfield 6-8300.

Title... Company.....

Address.. City..... Zone State.... WINTER WINTER MINISTER MANAGEMENT OF THE STATE OF THE STA

It pays you to use

BALANCED TAPS

It takes care and skill to make taps that perform with BALANCED ACTION. Only Winter makes them.

It pays you to use BALANCED ACTION taps because of their accuracy—their longer life—and your saving in scrap losses.

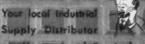




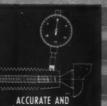
UNIFORM FLUTE CONTOURS



PRECISION CHIP DRIVER CONTOURS ALWAYS AT YOUR



cerries a complete stock of Winter Scienced Action Taps.



CONCENTRIC CHAMFERS

VINIER

Rechester, Michigan, U.S.A. Distibutors in principal cities, Branches in Nov York • Detroit • Chimpo • Delice • Son Francisco



Distributors in principal cities.
Factory branches: New York * Detroit Chicago * Dallas * San Francisco Los Angeles



CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs and Special Tools.





40-MACHINERY, November, 1954

Dual personality... with one idea in mind — profit!

Both metal hog, and tolerance miser — this versatile machine's only goal is turning out better work faster. It's the G&L 350-T Horizontal Boring, Drilling and Milling Machine

H ERE'S how this ultra-precision, 30 Series table-type machine helps you increase boring, drilling and milling efficiency. First of all, its open construction and rigidity allow you to handle either large or small work with equal precision on a production or custom run basis.

Furthermore, it's exceptionally versatile. Take the helicopter rotor hub job, illustrated at left, as an example. Here a 350-T helped produce a complex 250-lb. finished part from 3000-lb. forging . . . yet main-

tained tolerances to .0007"!

It's this kind of capacity, versatility and precision that helps you not only handle your current work more profitably . . . but also gives you extra capacity to handle future work requirements.

For complete details on this 5" spindle, 25-hp machine — or for information on all G&L quality-built Horizontal bars with 3-4-5-6 or 7" spindles; in table, floor or planer types — contact your G&L representative or write —



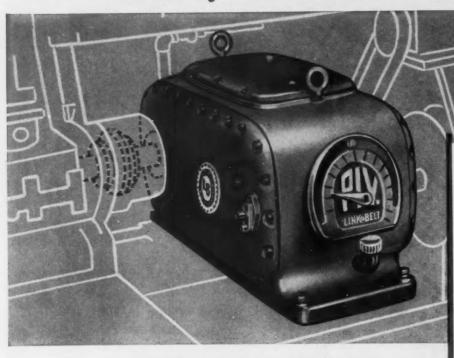
GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer type; Hypro Double Housing and Openside Planers, Planer Type Milling Machines; Vertical Boring Mills; and Davis Cutting Tools

Photo courtesy of Magna Mill Products South Gate, Calif.

For positive, stepless speed selection all industry uses Link-Belt P.I.V.



Operates independent of friction from maximum to minimum speeds

FOR speed changing that's completely positive . . . completely stepless-Link-Belt's P.I.V. has no equal. Here's a totally enclosed allmetal variable speed drive that provides exact speed selectionsindependent of friction.

Following are just a few of the jobs P.I.V. performs with matchless precision:

• Exact synchronization of rotating parts and machines

- · Accurate control of process speeds
- · Precise regulation of rotary mo-
- Flexible, accurate timing
- Stepless control of production lines or individual machines

Find out how P.I.V. can extend the useful range of your machine operations. Your Link-Belt office or distributor will give you all the facts. Call today, or write for Book 2274.

Here's the inside story



NO SLIPPAGE -Teeth of the radially grooved wheels (above) are cut at a constant depth but are of in-creasing width toward the wheel periphery. The sides are beveled to provide gripping areas for the self-tooth-forming chain (below). The chain slats shuffle back and forth between the wheels—mesh fully when they engage.



4 of 16 P.I.V. types — 1/2 to 25 hp — ratios to 6:1



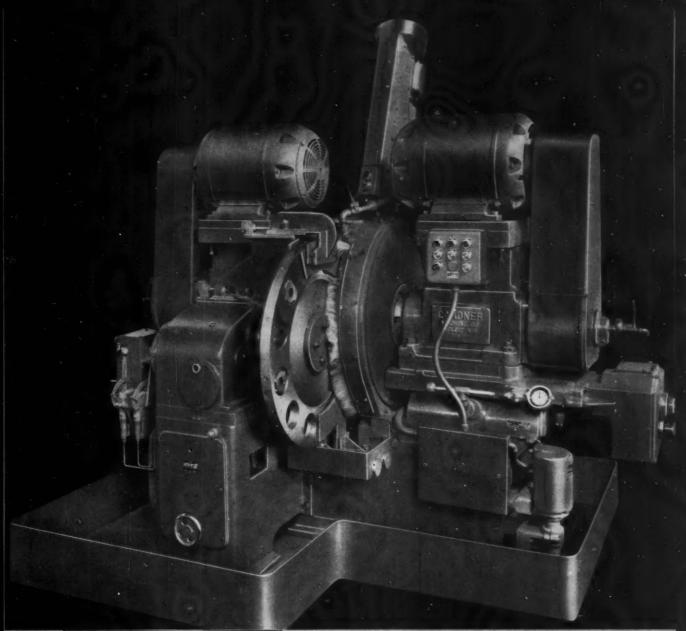


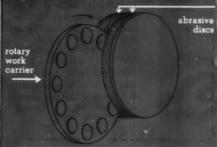


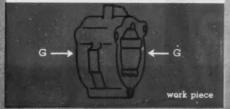




LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.







GARDNER MACHINE COMPANY

414 Gardner St., Beleit, Wisconsin, U.S.A. 135M

GRIND PARALLEL SURFACES IN ON OPERATION

work data MACHINE

PART PRODUCTION STOCK REMOVAL

Gardner No. 125-30" Double Spindle Grinder with rotary work carrier.

Cast iron valve housing for power steering mechanism. 600 pieces per hour.

.100" overall.

.002" for parallelism; .005" for uniformity. 2 Gardner Yellow Rim Wire-Lokt Discs.

precision disc grinders

HOW WARNER & SWASEY FOR THOR POWER TOOL

Take a look at some of the typical time and cost savings delivered by Warner & Swasey 5-Spindle Automatic Bar Machines at Thor Power Tool Co., Aurora, Illinois...



REDUCTION GEAR BLANKS

Savings pay for several new machines!

Large variety required—in lot sizes of 150-1500 pieces. Material: 8460 Steel.

Previous method:

2 single-spindle automatics, running continuously.

NOW

-One Warner & Swasey 5-Spindle Automatic does complete machining in equivalent of 4 days a week.



REDUCER BUSHING

Cuts Class 4 threads in same operation—costs reduced 8.5 to 1!

Previous method:

Threads milled, following rough forming on single-spindle automatic.

NOW

-Complete machining finished on Warner & Swasey 5-Spindle Automatic in one operation in 27 seconds!



DRIVE SHAFT

Accuracy and rigidity deliver 4 to 1 savings!

Material: Super tough rivet set alloy, especially made for Thor.

Previous method:

Roughed on single-spindle automatic, straddled to length on turret lathe both machines running at half speed.

NOW

-finished for grinding in single operation on Warner & Swasey 5-Spindle Automatic running at full speed.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

AUTOMATICS CUT COSTS

COMPANY





SANDING PAD NUT

One machine does work spread over 3 departments!

Problem: To thread part at perfect 90° angle to outside face, and hold concentricity.

Previous method:

Part machined in 3 different departments. Difficulty was experienced in holding piece in fixture for knurling.

NOW

-Thread tapped into bar stock and balance of cuts made, including knurling, in one operation on Warner & Swasey 5-Spindle Automatic.



THIN WALLED PROTECTION NUT

Combines operations at high removal rate!

Previous method:

Three operations – rough turned, relief cut made in second operation, Class 3 threads hobbed in third. Cost of last step alone ran 20¢ per part.

NOW

-finished in one operation in 132 seconds on Warner & Swasey 5-Spindle Automatic.



LOCK COLLAR

Slashes machining time on longer runs!

Quantities: 20,000-30,000 pieces.

Previous method:

Run on conventional multi-spindle automatics in 75 seconds.

NOW

-on Warner & Swasey 5-Spindle Automatics parts made in 27 seconds!

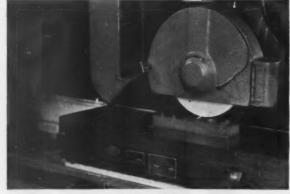


MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

COMPLETELY NEW

... A COMPLETE LINE!

VAO TOOL ROOM WHEELS





A COMPLETE LINE OF WHEELS (Straight . Recessed . Straight Cup) FOR EVERY TOOL ROOM OPERATION

... continually putting more sense in your abrasive dollar



COMPLETELY NEW! FASTER CUTTING ... and

COOLER CUTTING Even heavy infeeds can be taken without burning the stock or over-

GREATER FORM-HOLDING

EASIER, FASTER DRESSING

when required, because of the special new vitrified bond composition. EASY TO ORDER! Grit for grit, grade for grade, these new wheels match your present specifications. But-see how the V40 Bond Wheel outperforms any other tool room wheel you are now using.

TRY ONE NOW! Call your CARBORUNDUM Distributor or Salesman (listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels") for full details on these outstanding wheels. One trial will convince you! Write to The Carborundum Company, Dept. M 81-412, Niagara Falls, N. Y.

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-27

96 Inch Heavy Duty Betts-Bridgeford Lathe

BETTS-BRIDGEFORD

CONSOLIDATED MACHINE TOOL

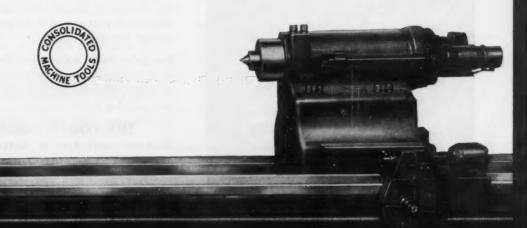
Wholly owned subsidiary of Farrel-

You Can Run This BETTS-BRIDGEFORD LATHE AT THE CUTTING TOOLS!

All of the feeds and all of the 20 to 1 range driving motor speeds are electronically selected and controlled at the cutting tools! Both are infinitely variable and can be changed in fine increments while the tools are cutting!

Push buttons on the control panel traverse the carriage right or left and the tools in or out.

Only for thread cutting or shifting in or out of the face plate drive, does the operator have to leave his working position at the cutting tools.

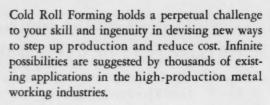


CORPORATION, ROCHESTER, N. Y.

Birmingham Company, Incorporated

COLD-ROLL FORMING...

CHALLENGE PROMISE



New applications are constantly being discovered. Total production of Yoder cold roll forming machines now runs into billions of feet annually.

A Yoder roll forming machine can be arranged for doing other operations, such as notching, embossing, perforating, curving, coiling, welding, etc., at little or no extra labor cost. Yoder engineers are at your service in designing such multipurpose production lines.

The Yoder Book on Cold Roll Forming discusses its varied functions and advantages, with scores of photos illustrating end uses of roll formed products. Ask for it.

THE YODER COMPANY

5504 Walworth Ave. . Cleveland 2, Ohio

Complete Production Lines

- * COLD-ROLL-FORMING and auxiliary machinery
- * GANG SLITTING LINES for Coils and Sheets
- * PIPE and TUBE MILLS-cold forming and welding





Winning Point with OPERATORS...

. . . CIMCOOL° COOLS SO FAST that workpiece, tools and chips actually stay cool to the touch! With this radically new and different cutting fluid on the job, there is no need for gloves, no need to cool the workpiece before removing it from the machine.

And there are other reasons why Cimcool scores with operators. This revolutionary cutting fluid—this chemical emulsion—virtually eliminates rancidity and foul odors. Can't burn. Can't smoke. Doesn't soil hands or clothes and contains no skin irritants. And leaves no hazardous slippery film on the hands, machine, workpiece or floor.

Let us show you how CIMCOOL can put your plant in the winning column. We'll be pleased to demonstrate—on your own machines—how CIMCOOL makes jobs better . . . and does a better job. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address Sales Manager, Dept. M-114, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

^oTrade Mark Reg. U.S. Pat. Off.

CIMCOOL

for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

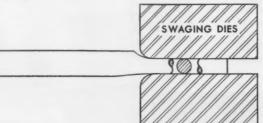


The application of the swaging process to the forming and finishing of metal stampings has almost unlimited possibilities. Here is an example.

-by Swaging



Flat stampings like this one can be given rounded sections, accurately sized, without turning or grinding, by one simple swaging operation.



Can Swaging Improve Your Forming Operations?

- 1. Swaging is economical—no chips, no wasted material
- 2. Swaging is simple—can be done by unskilled labor
- 3. Swaging is fast—gives you increased output of special shapes

Our informative booklet on Swaging may give you other ideas for your own "swaging success story." Why not write for it today?



THE TORRINGTON COMPANY

Swager Department 300 North Street, Torrington, Conn. Makers of Torrington Needle Bearings

TORRINGTON SWAGING MACHINES

from







Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

AUTOMATIC LOADING GIVES PRODUCTION A BIG LIFT

Simplimatic lathe gets "Automation" assist

It wasn't the machining job itself. That's done with speed and precision on the Gisholt Simplimatic Automatic Lathe. But the real trick was getting the big, heavy workpieces on and off the machine. Slow, awkward handling was penalizing production. So this special handling equipment was devised.

The same basic tool setup is used to machine six different sizes of motor frames—with tools on two vertical slide housings doing finish facing, boring and chamfering at both ends of the housings.

push-button loading

Note the special loading and unloading device. It works this way: Motor frames are slid from a conveyor onto loading cradle "A." At the push of a button, the frame swings in between the vertical slide housings and then moves longitudinally until it is over the expanding-type arbor, ready for chucking. A manually-moved locating stop positions the frame. After chucking, the loading cradle retracts, permitting the outer vertical slide housing to move in and support the mandrel during machining.

While the Simplimatic goes through its automatic cycle, the operator readies another part by re-loading the cradle. Unloading of the machined part is handled by the second cradle "B" which swings in between the housings and takes the frame as the mandrel releases. Floor

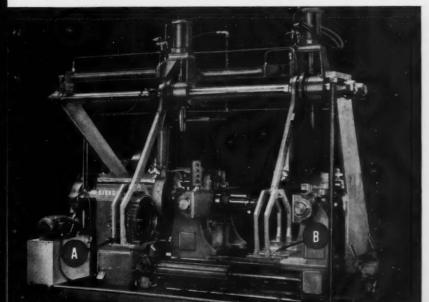
to floor time for the largest frame is 3.5 minutes.

Changeover is fast. Removable guide rails are used in the cradles for locating and loading the frames. Different bore sizes are accommodated by removable shoe segments on the expanding mandrel. A crank arrangement repositions the outer slide housing for different frame sizes. Tool slides have micrometer-type adjustment screws with dial indicators for fast, accurate tool setting.

Faster loading and unloading of heavy parts with this special device increase productive time of the Simplimatic, lessen operator fatigue, cut costs. It is another example of the trend towards "automation."

Simplimatic Automatic Lathe with overhead-mounted hydraulic-operated loading/unloading device. Workpiece loads at cradle "A" and is unloaded on cradle "B."





Operator pushes button to start loading cradle into position to chuck part.

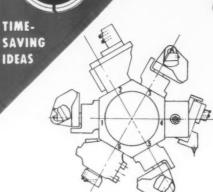


Workpiece being machined.



SINGLE-TOOL WORK PUT "ON THE DOUBLE"

Unique Fastermatic setup generates radii with swinging tools



Only single-tool or generated cuts could achieve the accuracy and finish required for the seat faces and snapfit diameters on these parts for water meter chambers. Note how the problem is solved by two Gisholt 1F Fastermatic Automatic Turret Lathes with a unique tooling setup. Nickeliron workpieces come to the machines with reverse sides machined, drilled and bolted on chucking plates.

Here's the operational sequence:

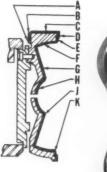
Turret 1-Generate radii F and H. Turret 2-Rough and finish turn C. Turret 3-Burnish radius H and break corner K.

Turret 4-Finish face G and chamfer J with angular mounted slide tool and turret facing attachment.

Turret 5-Finish generate radius F. Turret 6-Finish face D and E.

Front C/S—(Not shown on drawing)—
Finish face A, semifinish face
D and chamfer B.

One man and two Fastermatics with singlepoint tooling produce 320 parts per 8-hour day with this novel setup-12% better output than former way.

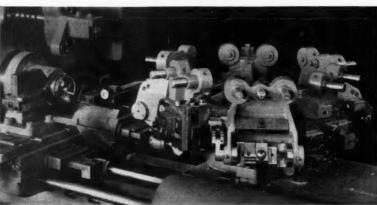


IDEAS





Special radius generating tooling on hexagon turret stations.



BALANCING AND CORRECTION COMBINED IN ONE HANDLING Built-in Drill Spindle Speeds Output of Gisholt DYNETRIC Balancer



The design of the improved Gisholt 1SV1 Static Balancer easily permits the addition of correction equipment, such as drill spindles and welders. This makes production balancing simpler, faster and less expensive

Note how this well-known manufacturer is balancing flywheels. The cast iron parts are held on an expanding arbor and rotated. The operator notes the angle and amount of unbalance. The amount is indicated in terms of drill depth on the directreading meter located conveniently beside the work and the angular location is indicated by the number observed on a dial under a stroboscopic lamp.

Stopping the machine, the operator indexes the part for correction drilling at the location specified. Movement of the feed lever brings a thrust support under the workpiece and starts the drill. The vacuum chip remover comes down with the drill, removing the chips as they are formed. When the reading on the drill depth dial corresponds with the indicated amount of unbalance, the drilling is

In this efficient setup for measuring, locating and correcting unbalance in one chucking, output is at the rate of 53 parts per hour at 80% efficiency.



Ask for information on courses offered by Gisholt Balancing School.



CONTOUR BORING ON FIXED CENTER TURRET LATHE?

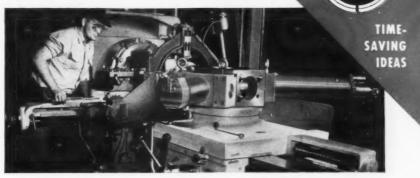
Special tooling and cam plate show the way

This workpiece is large, awkward and unwieldy. It's a gun recoil mechanism cradle assembly-28" long by 191/2" in diameter.

The job starts with the bore being chamfered from the square turret. A live center supports from the hexagon turret while square turret tools face the end and turn the O.D. Then a steadyrest is moved to support the part on the machined O.D. and the end is finish faced from the square

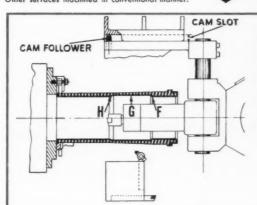
Of special interest is the method for final contour boring achieved by a cam plate mounted on the rear bedway. A special trunnion, with one arm carrying the cam follower and the other carrying the boring bar and tool, pivots through the hexagon turret mounting. The boring tool alternately raises and lowers with the cam as the hexagon turret carriage feeds in toward the headstock.

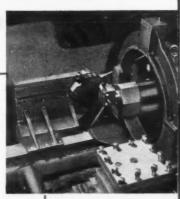
In this novel setup, accurate contour boring is easily accomplished by a cam-guided tool on this fixed center hexagon turret lathe.



Close-up shows angle plate on bedway and cam arrange... ment for guiding boring bar on fixed center turret lathe.

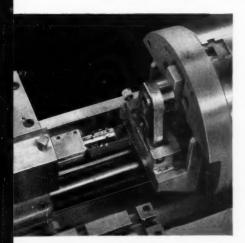
Contour F-G-H handled with special cam attachment. Other surfaces machined in conventional manner.





A FIRST-RATE JOB OF HOLDING AND MACHINING

Quick Changeover for Five Sizes Keynotes No. 12 Hydraulic Job

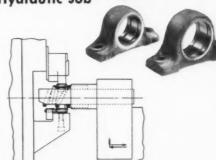


Single floating jaw in counter-balanced chucking fixture works for five sizes.

How to set up for simple, speedy machining and changeover for various size parts is nicely illustrated here.

This Gisholt No. 12 Hydraulic Automatic Lathe handles all production requirements for five sizes of cast iron pillow blocks. Holding is provided for by a special fixture mounted in a standard 3-jaw air chuck. Clamping pressure is applied to the feet, thus eliminating any distortion.

A single boring bar held in the front carriage does rough and finish boring and chamfering with longitudinal movement and then straddle faces, cuts snap ring grooves and chamfers with transverse movement. No tool marks left in the bore this way. Part sizes vary from 1.378" to 2.440" in the bore and time ranges from 1.3 to 1.9 minutes f.t.f.



Changeover is simple. For tooling, a new boring bar is added. For chucking, the centerline is changed with a riser plate. That's all there is to it.

A good example of how rough and finish machining of various size parts is speeded with separately tooled, easily changed boring bars.





TIME-SAVING IDEAS

Whenever you can combine three operations in one, you're time and money ahead. One such "how-to-do-it" is illustrated here...in the production of these fractional horse-power electric motor housings.

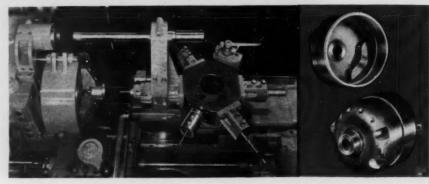
Instead of machining and then broaching a locking groove and then pressing in a bushing—as separate operations—this Gisholt No. 3 Ram Type Turret Lathe is expertly tooled to perform the *entire* job.

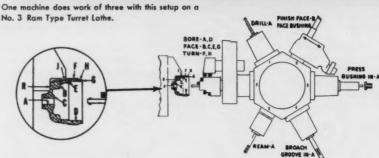
The layout shows how tools on the hexagon turret, in addition to standard machining, broach the groove and press in a bushing—all in one chucking. To complete the operation, the bushing and the housing are both finish faced from the last hexagon turret face. Time is only 1.37 minutes.

By skillfully doubling up operations on one machine, this producer eliminated a great deal of rehandling, saved real time and money in production.



Machining, Broaching, Pressing Done on One Machine





PARTS SUPERFINISHED AT RATE OF 140 PER HOUR

One operator tends two-spindle machine

Showing setup of Gisholt Two-Spindle Superfinisher, with push-button control panels for each station. This European manufacturer had the problem of Superfinishing four different transmission parts, including a gear and shaft assembly plus three similar gear parts as shown. The requirement was for high production and, naturally, for the most economical method.

The practical solution was worked out by Gisholt engineers using this No. 54 Two-Spindle High Production Superfinisher. Since both stations have a fully automatic machine cycle, only one operator is needed to load

and unload parts, alternating between stations. Note that each station has its own separate push-button control panel so that after loading, the operator merely engages the cycle start button.

The left-hand spindle station is in continuous production on gear and shaft assemblies. The right-hand station has tooling setup changes for the 3 other gear parts. On all workpieces, Superfinish is performed on a 7 degree tapered surface on the backrim I.D. Surface reading of from 25 to 30 micro-inches is reduced by Superfinishing to 4 micro-inches or less. With floor-to-floor time of only 35 seconds per part, total production is 140 parts per hour at 80% efficiency.

With this high-production setup, one machine and one operator handle a variety of parts to easily meet production requirements—and with real economy.



No. 11-1254

631

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT

Madison 10, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

If you tap or drill small parts

you can't afford to be without - Ettco-Emrick

-ENGIN MULTIPLE HEADS

To put your small parts tapping and drilling on a low-cost, mass production basis you need specially engineered methods and equipment. Ettco's years of specialization in this field has led to the development and refinement of the Ettco-Emrick "Unit-Engineered" Multiple Head System, which is one of today's fastest, most economical methods of tapping and drilling small parts. Here's what it provides -

- Multiple head and work holder engineered as a unit for your specific part to insure fastest handling and production with each stroke of the drill press.
- A selection of dozens of different standardized methods of handling a wide variety of shapes and sizes of parts and number and spacing of
- Interchangeable tapping and drilling face plates to permit quick, easy changeovers from tapping to drilling — a patented Ettco-Emrick feature.
- A design that assures quick, easy installation on any make or model drill press.
- A limitless variety of spindle arrangements with capacities ranging from wire sizes to 3/8" in steel.

DO JOBS LIKE THESE FASTER, EASIER, AT LESS COST



Steel outlet box with 4 tapped holes. Production—12,800 tapped holes per hour with dual mul-tiple head unit.



54 holes drilled and countersunk in one operation with a multiple head and electric indexing



Die casting with 6 holes - 3 in each of two planes - automatically positioned and tapped in one operation.

If your small parts production calls for multiple drilling, reaming, countersinking, tapping or threading — it will pay you to check with Ettco. Call in your nearest Ettco-Emrick distributor or send us a sample or drawing for recommendations and estimates.

FOR DETAILS. WRITE FOR **BULLETIN No. 3**





ETTCO TOOL CO., INC.

592 Johnson Ave., Brooklyn 37, N. Y.

DETROIT . CHICAGO . WORCESTER . SAN GABRIEL, CALIF. Dealers throughout the United States and Canada

DRILLING and TAPPING **EQUIPMENT NEWS**

Tapping Machines Boost Multiple Head Output



Ettco-Emrick tapping machines are designed for automatic or semi-automatic operation with multiple spindle drilling or tapping heads and single spindle tapping attachments. The No. 72A machine is foot or air-operated. The No. 74 machine is air operated and electrically controlled. Details in Bulletins No. 72A and No. 74. Write Ettco Tool Co., 592 Johnson Avenue, Brooklyn 37, N. Y.

Electric Indexing Fixture Has Fast, Precise Action



Ettco-Emrick Indexing Fixtures provide smooth, shockless, positive action. Can be used on any machine base. Synchroniza-

tion of index fixture with outside machine member is electrically controlled. Utilizes interchangeable nesting plates ranging from 10" to 14" in diameter. Details in Bulletin No. 97. Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn 37, N.Y.

Balanced Tap Chuck Insures Greater Accuracy

Balanced construction of this newly designed precision-made Ettco-Emrick tap chuck eliminates "whipping" action and insures greater accuracy. Light weight and small external dimensions minimize spindle inertia on reversing,



making it suitable for either light, sensitive work or heavy duty jobs. Only three sizes needed to cover the complete range of tap capacities from No. 0 to 1". For details, write Ettco Tool Co., Inc. 592 Johnson Ave., Brooklyn 37, N. Y.



Northern Pacific's Streamliner, Cocolalla Lake, Idaho

Shostal Press Agency Photo

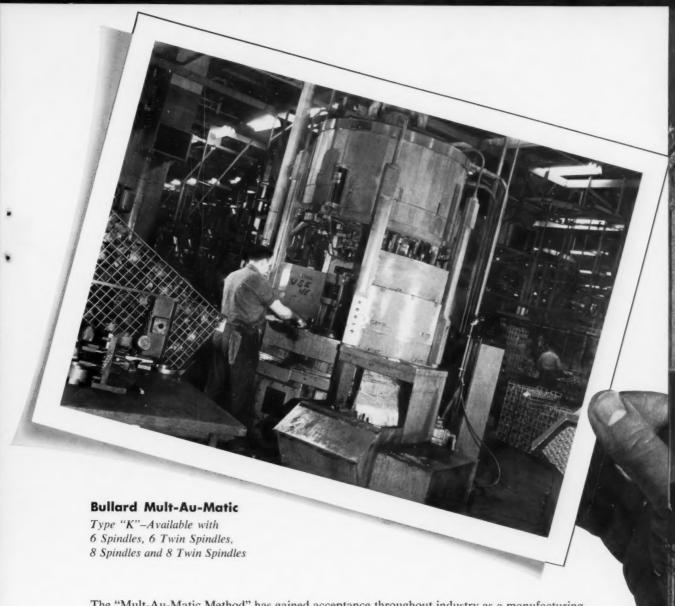


The
Invisible
Background
of
Industrial
Progress

Since the driving of the Golden Spike on May 10, 1869, linking the Central Pacific and Union Pacific Railroads, this mode of travel has been the lifeline of our commercial and industrial activities.

Railroads have kept pace with the needs of the nation by promoting more modern equipment and methods. Today's streamlined Diesels speed over the rails replacing steam locomotives. De luxe coach and Pullman cars, unknown a few years ago, now provide greater conveniences and luxuries for the traveler.

Railroads and manufacturers of railroad equipment have long recognized the importance of *Modern Machine Tools* in the efficient production of their products — evidence of "The Invisible Background of Industrial Progress."



The "Mult-Au-Matic Method" has gained acceptance throughout industry as a manufacturing method that has contributed greatly to the economic production system.

The Type "K" Mult-Au-Matic is engineered and built to increase the scope of the "Mult-Au-Matic Method" by reducing production costs on the small and medium-size jobs. Here are some of its features:

High spindle speeds

Independent and variable feeds for each tool head

Positive feed stops assure work accuracy

Power-operated chucking maintains cycle time

Twin spindle application for high production

Minimum floor space in relation to productive capacity.

These features can provide increased efficiency to your machining problems. A Bullard Sales Engineer will be pleased to discuss them with you. Reach him by calling the nearest Bullard Sales Office or write to The Bullard Company, Bridgeport 2, Connecticut — phone EDison 6-2511.





Dipper sticks have to be strong to absorb severe stresses. That's one reason why the three main sections of this part are UNIONMELT welded. Sound welds can be made in metal up to 3-in. thick in a single pass.

A power shovel dipper stick has to be strong. It must withstand severe banging, twisting, and bending stresses as its huge scoop bites out hundreds of tons of earth and rock in each day's operation. But these dipper sticks can take it they're made by Unionmell welding.

Strong, clean UNIONMELT welds can be made in metals up to 3-in, thick in a single pass. There is no limit to the metal thickness that can be joined by multiple passes.

Research and years of experience have helped Linde to develop a top notch team of fabricating processes—Heliarc, sigma, and Unionmelt welding. For small shops or huge production lines, from carbon steel to complex alloys—there is a Linde electric welding process to do the job. Your local Linde representative will help you determine the best welding process for your job. Call him today for more information.

LINDE AIR PRODUCTS COMPANY

A Division of Union Carbide and Carbon Corporation 30 East 42nd Street New York 17, N. Y.

Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited, Toronto



[&]quot;Heliarc," "Unionmelt," and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation.

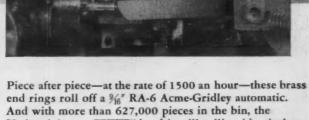
and the National Acme "FETTE" thread rolls are still going strong



National Acme "FETTE" Self-opening Thread Rolling Heads are used on automatics, turret or hand lathes, threading machines, drill presses, and other types of vertical and horizontal machines.

Design simplicity and rugged construction insures long life of head and rolls. Made in revolving type in capacities $\frac{7}{16}$ to 1"; non-revolving type $\frac{1}{16}$ to $\frac{3}{4}$ ".

Ask for Catalog FRH-53



National Acme "FETTE" head is still rolling identical threads with the same set of rolls.

You don't have to figure it out. When you use these selfopening thread rolling heads you know:

- threading speeds will be the same as high speed steel turning tool speeds
- threads will be more accurate, stronger and smoother by this "cold-forming" rolled thread process
- trouble-free performance of National Acme "FETTE" heads means uninterrupted production—less down time
- more "mileage" with a set of rolls means lower cost per piece

Check the advantages of FETTE heads for your threading jobs - send sample or print for our recommendations, or ask our representative to call.

The NATIONAL ACME COMPANY

170 EAST 131st STREET . CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 an Hydraulic Thread Rolling Machines • Automatic Threadi Taps • Limit, Mater Starter and Control Station Switches • Contract Manufacturing.



Bearing performance becomes a reality when you use the Norma - Hoffmann "Cartridge" Bearing in your products. This double-row width bearing has 100% greater grease capacity than conventional bearings. The highly efficient seals lock grease in . . . keep dirt out. Carefully factory-packed with Norma-Hoffmann's specially compounded grease assures high antifriction performance for years on end. These are but a few of the reasons why the Norma-Hoffmann' Cartridge' Bearings is "America's No. 1 Sealed Bearing."

Norma-Hoffmann

AMERICA'S NO. 1 SEALED BEARING

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONNECTICUT — Founded in 1911
FIELD OFFICES: Chicago, Cincinnati, Cleveland, Dallas, Detroit, Kansas City, Los Angeles, San Francisco, Seattle

Another Unusual Application of Gardner Abrasive Discs



Selecting an abrasive for grinding rough concrete floors was a problem recently faced by Whiteman Manufacturing Company of Los Angeles. Their line of cement floor surfacing machines must hold up under conditions of heavy stock removal.

The Gardner #16 grain, deep corrugated YELLOW-RIM WIRE-LOKT disc proved the solution to this problem by providing the required combination of heavy cutting plus long life.

Solving problems like this is the job of the Gardner Abrasive Engineer. Call him for help on your grinding jobs. Gardner Machine Company, 414 Gardner Street, Beloit, Wisconsin, U.S.A.

1234



GARDNER

abrasive discs



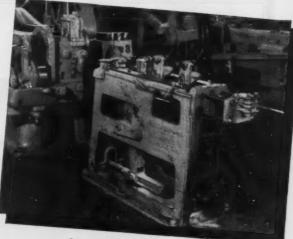
In addition to a complete line of standard wire drawing and bar drawing machines, Ajax designs and manufactures special drawers to meet a wide variety of special requirements. Whether the need is for round, square, hex., keystone or rectangular section stock to close tolerances or whether the drawer is to be used in conjunction with cold headers, presses or special machines, Ajax can build it to meet the requirements and at a cost consistently low for the size and quality of the machine produced. If you have a need for drawing ferrous metals from 1010 to 52100 or non-ferrous metals with enough hardness to permit gripping, which is beyond the range of one of our standard drawers our engineers will be glad to discuss your particular requirement with you. We will be glad to send further information.

- A Bar Drawing and Straightening Machine
- B Drawing, Straightening and Cutting off Machine
- C for Drawing Keystone Stock
- D for large Waterbury-Farrel Nut Machine
- E for 1/2" Nut Machine
- F for 1/4" Waterbury Header
- G for 3/8" Waterbury Header
- H for No. 51/2 Minster Press
- I for Double End Spoke Header
- J Continuous Drawing Machine
- K for 5/8" Bolt Maker

THE Ajax MANUFACTURING CO.

Built 20 Years Ago and Still Going Strong

AJAX-HOGUE Wire Drawers



One of the first Ajax-Hogue Wire Drawers Built. Still in operation at the Chandler Products Corp. Cleveland, Ohio



Courtesy of Tru-Fit Screw Products Corp. Cleveland, Obio



Courtesy of Chandler Products Corp. Cleveland, Obio

These Ajax - Hogue Wire Drawers Have Been Drawing Accurate and Straight Wire from Coiled Rods for Cold Headers Since 1934

- write for Bulletin No. 111-A -

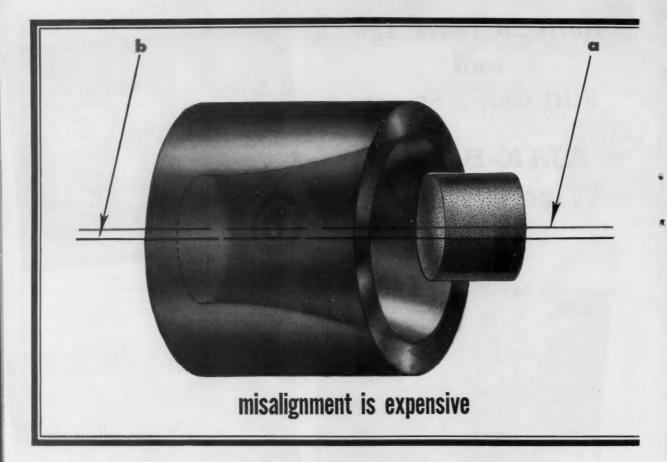
THE Ajax MANUFACTURING CO.

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

110 S. Dearborn St. CHICAGO 3, ILL. Dewart Building
NEW LONDON, CONN.

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-41



... Bryant controlled alignment

To grind a taper, the internal grinder must be set up according to simple geometric principles; that is, the path of the grinding wheel must be a straight line and must intersect the axis of the workpiece at a point. In the illustration, the axis of the wheel path "a" and the axis of the work "b" lie in parallel planes. The axes cross, but fail to intersect. Under these conditions, it is impossible to grind a true taper. As the grinding wheel enters the large end of the taper, the point of contact is high. This end of the taper can be ground to size. As the wheel progresses through the hole, the contact moves even higher, with the result that the hole will be pro-



Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie—free showings arranged for engineering groups.

The Bryent 1416 Internal Grinder is a semi-automatic machine for grinding bores in long parts and is adaptable for either production or tool room work. It will swing work up to 16" and grind bores up to 9" depth. The work is held in a standard hollow work spindle and steadyrest. The workhead may be adjusted longitudinally over a distance of 37" to meet the requirements of a large variety of work. It may be pivoted for grinding a taper up to 30° included angle. Hydraulic operation provides a wide range of traverse speeds. The rear of the wheelslide can be adjusted to insure straight line motion of the wheel. Write for folder.

gives better internal grinding

gressively oversize and a curve is generated instead of a uniform taper.

A taper ground under these conditions probably will blue only in the middle. Turning the workhead may shift this plug contact but, as the wheel wears, the plug contact will continue to move. The remedy is to correct alignment so the wheel path and wheel axis "a" and the work axis "b" intersect and lie in a plane which includes the diamond. Then a uniform taper will be generated. In shop practice the adjustment would be made by bringing the wheel and work to exactly the same center height.



Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

or write for copy Offices: Indianapolis · Cleveland · Chicago · Detroit · Mt. Vernon, N.Y. · Philadelphia
Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

For more information on products advertised, use Inquiry Card, page 265



no. 1109 9" swing, semi-automatic



no. 1309-W 9" swing, 2 spindle semi-automatic



no. 2209 9" swing, automatic



no. 1116 16" swing, semi-automatic

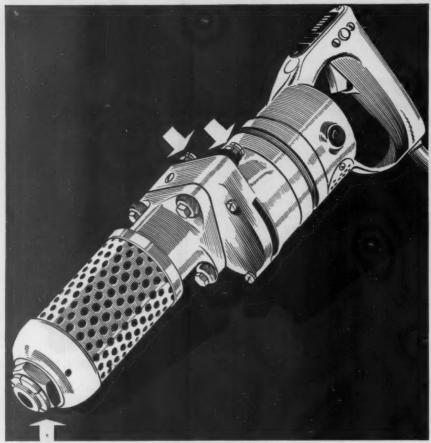


Sometimes of the second of



no. 1460 60" swing, semi-automatic

MACHINERY, November, 1954-43



This portable electric hammer is completely self-contained. So are the one-piece, all-metal FLEXLOCS that hold it together, even under the intense impact vibration induced by the rapid hammering action.

FLEXLOCS chosen to withstand vibration of 3000 hammer blows per minute

The manufacturer of this portable electric hammer reports, "FLEXLOC Self-Locking Nuts have solved our problem of obtaining a desirable fastener, because they withstand the terrific vibration induced by the impact of 3000 hammer blows per minute without working loose."

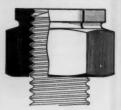
This portable electric hammer is subjected to terrific impact-induced vibration. The fasteners that hold it together must take the same beating. The FLEXLOCS were selected only after numerous fastening devices had been

tested. Two ¼"-20 nuts hold the fastening bolts securely in position on the forward end of the hammer. One 1"-14 nut prevents loosening of the components at the nose.

You can get FLEXLOCS of various types and materials in a wide range of sizes and in any quantity. And these one-piece, all-metal locknuts are carried in stock by leading industrial distributors everywhere. See your FLEXLOC distributor or send for literature and samples. STANDARD PRESSED STEEL Co., Jenkintown 19, Penna.



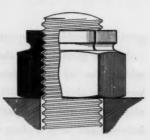
Starting. A FLEXLOC starts like any ordinary nut. Put it on with your fingers. Tighten it with a standard hand or speed wrench.



Beginning to Lock. As the bolt enters the segmented locking section, the section is expanded, and the nut starts to lock.



Fully Locked As a Stop Nut. When 1½ threads of a standard bolt are past the top of the nut, the FLEXLOC is fully locked. A FLEXLOC does not have to seat to lock.



Fully Locked As a Seated Nut. When it is used as a lock or stop nut, the locking threads of the FLEXLOC press inward against the bolt, lifting the nut upward and causing the remaining threads to bear against the lower surface of the bolt threads. Vibration will not losen a FLEXLOC, yet there is no galling of threads.



LOCKNUT DIVISION



Cincinnati Milling at







OLD IN EXPERIENCE

NEW IN PRODUCTS, PLANT, AND WAYS

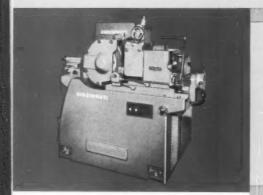
TO PERFORM METALWORKING OPERATIONS

AT A LOWER COST

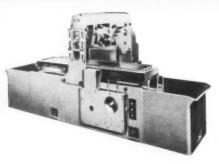




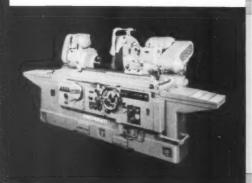
You will always find something new at Cincinnati Milling . . . new ideas blended with 70 years of experience in serving industries of all types. Five of Cincinnati's newest machine tools and production ideas are illustrated here. You may obtain more information by writing for literature. For your convenience, our direct offices and representatives are listed on the fourth page of this message. The Cincinnati Milling Machine Co., Cincinnati Grinders Incorporated, Cincinnati 9, Ohio.



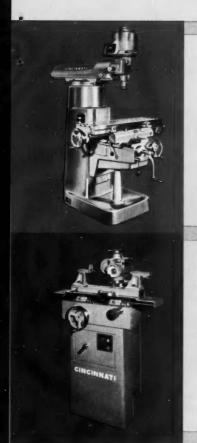
New CINCINNATI FILMATIC No. O Centerless Grinder. It incorporates new ways to reduce setup time; new ideas in producing higher quality finish; more powerful. New specification catalog is yours for the asking. Cincinnati also has a new No. 2 FILMATIC Centerless Grinder. Ask about it.



New CINCINNATI HyPowermatic Milling Machine. Everything new, including Hydramech Table Drive with variable feed and backlash eliminator. 42 sizes, plain and duplex styles, up to 168" travel and 50 hp spindle drive. Do you want more information? We will gladly send it to you.



New production features for CIN-CINNATI FILMATIC Plain Hydraulic Grinders may now be obtained, including automatic infeed and traverse cycles; automatic sizing; automatic wheel truing. These new developments sharply reduce precision grinding costs.



New CINCINNATI No. 1 Toolmaster Milling Machine. A new member of the Cincinnati line gives you a new conception of rugged construction and maximum operator convenience for light milling operations. Desired by toolmakers everywhere.

New CINCINNATI No. 1 Cutter and Tool Grinder. A fitting companion for the famous CINCINNATI No. 2 Machine. Incorporates many new ideas and features of versatility for quickly and accurately sharpening cutters of all types. You'll want to know more about this one.

CINCINNATI

OLD IN EXPERIENCE. . . NEW IN PRODUCTS, PLANT,
AND WAYS TO PERFORM METALWORKING OPERATIONS
AT A LOWER COST



SALES REPRESENTATIVES

ALABAMA, BIRMINGHAM 3: McVoy-Heusman Co., 2024 Sixth Ave. N., Phone: 3-9271

CALIFORNIA, LOS ANGELES 58: Harron, Rickard & McCone Ce. of Sou. Cal., 3858 Sante Fe Ave., Phone: Logan 5-8361

CALIFORNIA, SAN FRANCISCO 10: Harren, Rickard & McCone Co. of Nor. Cal., 2070 Bryant St., Phone: Atwater 2-2202

COLORADO, DENVER 4: Overgerd Mechine Tool (e., 2045 West Eighth Ave., Phone: Main 3141

FLORIDA, JACKSONVILLE 3: Farquhar Machinery Co., 2120 Market St., Phone: 4-6781

FLORIDA, MIAMI 9: General Equipment Incorporated, 543 Northwest Fifth St., P. O. Bax 1470, Phone: 2-8468 or 2-8469

GEORGIA, ATLANTA 3: Chandler Machinery Co., 120 Heusten St., N. E., Phone: Walnut 3843

IDAHO, BOISE: The Salt Lake Howe. Co., 782 S. Eighth St., P.O. Box 1487, Phone: 42555

LOUISIANA, NEW ORLEANS 6: Dixie Mill Supply Co., Inc., Tcheupitoulas & St. Jeseph Streets, Phone: Raymond 6101

LOUISIANA, SHREVEPORT 93: Dixie Mill Supply Co. of Shreveport, 288 Edwards St., Phone: 2-0331

MINNESOTA, ST. PAUL 4: Anderson Machine Tool Co., 2631

University Ave., Phone: Nestor 6548
MISSOURI, KANSAS CITY 12: Robert R. Stephens Machinery Co.,

424 Nichols Rd., Phone: Logan 2123 or 4925
MISSOURI, ST. LOUIS 3: Robert R. Stephens Machinery Co.,
1786 Olive St., Phone: Garfield 6288, 6289 or 6290

NEBRASKA, OMAHA 8: T. S. McShane Co., 1113 Howard St., Phone: Jackson 1273

NORTH CAROLINA, ASHEVILLE: Tideweter Supply Co., Inc.,

95 Roberts St., P. O. Box 212, Phone: 2204
NORTH CAROLINA, CHARLOTTE 2: Tidewater Supply Co., Inc.,

147 Breverd Court, Phone: 4-1510

OKLAHOMA, TULSA 14: Robert R. Stephens Mechinery Co., The Boulder Bidg., Tenth & Boulder Sts., Phone: Tulsa 4-8478

OREGON, PORTLAND 14: Hallidie Mechinery & Equipment Company, 1545 S. E. Union Ave., Phone: Atwater 9641

SOUTH CAROLINA, COLUMBIA: Tidewater Supply Co., Inc., 807 Gervais St., P. O. Box 1138, Zone E, Phone: 26371

TENNESSEE, CHATTANOOGA 1: Noland Co., Inc., 115 Market St., Phone: 7-1784

TENNESSEE, MEMPHIS 2: Hays Machine Tool Co., 269 S. Front St., Phone: 5-8314

TEXAS, DALLAS 1: Dave O'Neall Machinery Co., 3722 Bowser St. et

Oak Lawn, Phone: Logon 8432
TEXAS, HOUSTON 1: Sam H. Penny Machine Tools, 3083 Louisiana

UTAH, SALT LAKE CITY 10: The Sait Loke Hardware Co., 105 M. Third St. W., P. O. Box 510, Phone: 3-5771

St., P. O. Box 1271, Phone: Keystone 3839

VIRGINIA, NORFOLK 1: Tidewater Supply Co., Inc., 581-535 W. Twenty-Fourth St., P. O. Box 839, Phone: 27311

WASHINGTON, SEATTLE 8: Mallidie Machinery Co., 218 Nudsen St., Phone: Lander 9528

DIRECT FACTORY OFFICES

BOSTON: 336 Washington St., Wellesley Hills 82, Mass. Phone: Wellesley 5-4670 or 5-4671

BUFFALO: 1807 Elmwood Ave., Buffalo 7, N. Y. Phone: Riverside 3402

CHICAGO: 104 N. Oak Park Ave., Oak Park, HI.
Phone: Chicago—Estobrook 8-1905 or Oak Park—Village 8-3804

CINCINNATI: 4701 Marburg Ave., Cincinnati 9, Ohio Phone: Redwood 2121

CLEVELAND: 4614 Prespect Ave., Cleveland 3, Ohio Phone: Henderson 1-4100

DETROIT: 24100 N. Woodward Ave., Pleasant Ridge, Mich. Phone: Jordan 4-6694 or Lincoln 5-6868

HARTFORD: 10 North Main St., West Hartford 7, Conn. Phone: Adams 3-6271

INDIANAPOLIS: 328 Chamber of Commerce Bldg., Indianapolis 4, Indiana, Phone: Metrose 5-7382

NEW YORK: 155 East 44th St., New York 17, New York Phone: Murrary Hill 2-5448 or 2-5449

PHILADELPHIA: 580 Lancaster Ave., Bryn Mawr, Pennsylvania Phone: Lawrence 5-4040, 5-4041, 5-4042

PITTSBURGH: 666 Washington Rd., Pittsburgh 28, Pa.
Phone: Locust 1-8116 or 1-8117

SYRACUSE: 472 South Salina St., Syracuse 2, New York Phone: Syracuse 74-5354 or 74-5355

The Cincinnati Milling Machine Co.
Cincinnati Grinders Incorporated
Cincinnati 9, Ohio, U.S.A.

U. S. TERRITORIES

HAWAII, HONOLULU 17: H. S. Gray Co., 759 Puuloa Road, P. O. Box 3016, Phone: 82244

CANADA

B. C., VANCOUVER 1: B. C. Equipment Co., Ltd., B. C. Equipment Bldg., 551 Howe St., Phone: Marine 2511

MANITOBA, WINNIPEG: Acme-Bertram Machine Tools, Ltd., 312 Power Bldg., 428 Portage Ave., Phone: 925-620

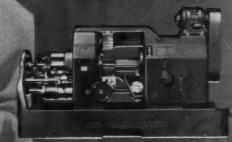
ONTARIO, DUNDAS: Hamilton Office
Acme-Bertrom Machine Tools, Ltd., Phone: 700

ONTARIO, TORONTO 4: Acme-Bertram Machine Tools, Ltd., 15 Branden Ave., Phone: Oliver 8461

ONTARIO, WINDSOR: Acme-Bertram Machine Tools, Ltd., 1922 Wyandotte St. East, Phone: 48644

QUEBEC, MONTREAL: Acme-Bertram Machine Tools, Ltd., 319 Drummond Bldg., Phone: Marquette 1356

how industry eliminates expensive rehandling



cme-Gridley & Spindle Ber Automatic-

with ACME-GRIDLEY Bar Automatics

Whether you "automate" or pick 'em up with your fingers, you're going to have a certain amount of handling in making any product. But, the less rehandling—the faster the job is done and the lower the cost per piece.

That is why more and more manufacturers are getting more operations on their primary machining equipment. It's also why, every day, more intricate parts like these—and larger ones, too—are being completed in one setup on multiple spindle Acme-Gridley bar machines.

Ingenious tooling of these versatile machines with standard National Acme toolholders and attachments often eliminates second operation work entirely—saves not only handling, but also extra machines, floor space and valuable man-hours. And in addition, the parts are more accurate because you don't have to re-chuck.

Check your machining methods today—then ask your engineers and ours to talk it over.

Remember—the biggest help to your competition is your continued use of obsolete equipment.

The NATIONAL ACME COMPANY

170 EAST 131st STREET . CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.

ON JOBS LIKE THESE



DRILLED STUD 3/8" diameter, 21/4" long. MATERIAL: B-1113 CD Steel.

OPERATIONS: 12 including rolled thread and spindle stopper for cross drilling to blind hole.

MACHINE TIME: 9 seconds (400 completed pieces per hour.)
(Formerly done in two setups)



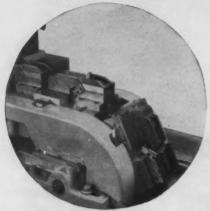
WORM 3/8" diameter, 13/4" long.
MATERIAL: B-1113 CD Steel.

OPERATIONS: 9 including machining the worm and broaching end of piece.

MACHINE TIME: 8 seconds (450 per hour.)

(Formerly done in three setups)

Ask for Catalog M-450



 Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

LOWER COST per piece with continuous SURFACE BROACHING of small parts...

e In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

THE FOOTE-BURT COMPANY

Cleveland 8, Ohio

Detroit Office: General Motors Building



Fengineered for production

FOOTBURT

50-MACHINERY, November, 1954

For more information on products advertised, use Inquiry Card, page 265



15,485 LB. HAMMER DIE MACHINED ON AXELSON 100" GAP BED LATHE

Turning large contour work and odd shapes such as aircraft landing struts are machining problems that are easily handled on Axelson Gap Bed Lathes.

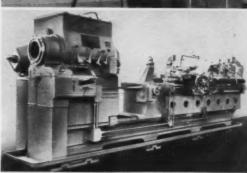
This particular lathe is machining a 15,485 lb. hammer die for forming the cowling for Douglas AD-5 and AD-6 "Skyraiders." The Axelson ball turning attachment permits the I.D. to be finish machined to a template, turn a radius on the bottom, after which the bottom is faced. Note the entire weight of the die is mounted on the spindle without tailstock support.

The machine is powered with a 30 H.P., D.C. motor with electronic control that permits infinite speed changes from 0.4 to 308 R.P.M. Motors up to 75 H.P. may be supplied for heavier work when required.

Similar machines equipped with standard Axelson attachments are finding applications in heavy industry for machining large irregular shaped parts, in the maritime industry for turning turbine rotor blades with integral shafts, and in the oil industry for turning heavy oil well equipment. There is no limit to the application of Axelson Heavy Duty Lathes for they serve all industries.

It will pay you to consider Axelson for solving your heavy duty turning problems economically. Call our qualified distributor in your locality or write direct to the factory for recommendations. Your request for assistance is without obligation.

Write for literature describing Axelson Heavy Duty Lathes, Models 16", 20W", 20", 25", 32"; Pracision Tool Room Lathe Models 16", 20"; Gap Bed Lathes 25"/100", 25"/125" or Special Machines. 6156 BOYLE AVE., LOS ANGELES 58, CALIF.





MACHINE FACTS

Machine—Axelson 100" Gap Bed Lathe
Swing Over Ways, Gap Closed—34½"
Swing Over Ways, Gap Open—100"
Spindle Bore: 11" Diameter
Spindle Speed Ranger: 0.4 to 308 RPM
Electronic Control provides infinite speed changes
Ball Turning Attachment: 9" to 36" Dia.
Distance Between Centers, Gap Closed: 144"
Distance Between Centers, Gap Open: 216" Max.
Machine Weight: 60,000 Lbs.
Note: For large work motors up to 75 H.P. can be supplied.















AXELSON MANUFACTURING COMPANY DIVISION PRESSED STEEL CAR COMPANY, INC.
LOS ANGELES 58, CALIFORNIA

PSC

DIRECT FACTORY SERVICE AVAILABLE FROM ST. LOUIS, PHILADELPHIA, KANSAS CITY, BUFFALO, AND LOS ANGELES AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL INDUSTRIAL CENTERS





YOUR CHOICE OF 3 METHODS FOR ACQUIRING NEW MACHINE TOOLS ON A SOUND BASIS

Jones & Lamson Machine Company now offers a 3-way marketing service to users of high-efficiency metal-cutting tools. This service, initiated by J&L after intensive study, covers every need and clears up all confusion on the problem: to lease or not to lease. You may buy outright... buy on a 1-to-5 year basis, at interest rates as low as $3\frac{1}{3}\%$... or you may lease on any of 4 variations of a rental plan. Write or phone Jones & Lamson Machine Company for full information and dependable advice.

JONES & LAMSON MACHINE CO.

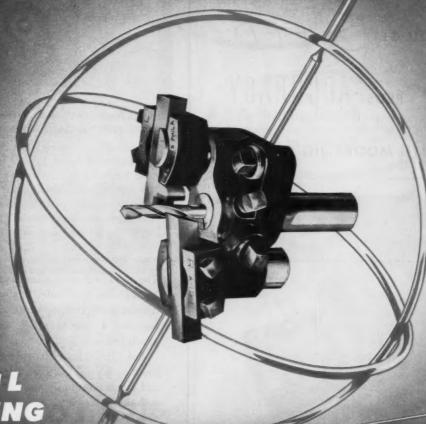
512 Clinton St., Springfield, Vermont, U.S.A.

UNIVERSAL TURRET LATHES . FAT AUTOMATIC LATHES . AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES AUTOMATIC THREAD & FORM GRINDERS . OPTICAL COMPARATORS . AUTOMATIC OPENING THREADING DIES & CHASERS

52-MACHINERY, November, 1954

For more information on products advertised, use Inquiry Card, page 265





R and L TURNING TOOL

Replaces an assortment of fourteen different tools . . . changes from right to left in ten seconds . . . no misalignment . . . extremely fine adjustment provided . . . for rough and heavy cuts as well as finishing cuts . . . The R and L TURNING TOOL is constructed with best possible care and of finest steel.

Write for Catalog



TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP. • FLOATING DRILL HOLDER • KMURLING TOOL

YOU GET SPEED
PLUS ACCURACY

WITH MOORE JIG GRINDERS



HOLES from 1/64" to 8" Relocated and Ground within .0001" in One-Third Previous Time

Before hardening, this two-station die block was Moore-Jig-Bored to eliminate the need for excessive grinding. After hardening and surface grinding, all holes were Moore-Jig-Ground to exact size and location. Blank hole and center piercing hole were ground with ½° included taper. Little clearance could be allowed between punch and die. Jig grinding time: only 2¼ hours.



CONTOURS, Too, Accurately Jig Ground and Checked in One Setting

This flanged punch, impractical to grind by any other method, was a natural for the No. 2 Moore Jig Grinder. All radii—male and female—were ground accurately to location and size. The piece, having been set up on a rotary table, was aligned to permit grinding of the angular surfaces. And the entire contour was inspected by the "indicator measuring" method while the punch was still on the machine.

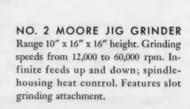
The word "versatile" must have been coined for the No. 2 Moore Jig Grinder. Not only does this machine relocate and grind straight and tapered holes with ease, but it contour grinds, chop grinds and slot grinds just as skillfully.

The Moore Jig Grinder, together with its toolroom teammate, the Moore Jig Borer, enables tool and die sections to be produced concurrently, puts diemaking on an interchangeable-parts-and-assembly basis. And it's also a time-saver on production jobs.

Employing the accurate lead screw measuring principle and a convenient system of coordinate hole location, the fast and sure Moore Jig Grinder eliminates hours of checking on bench and surface plate.

Why not find out how this remarkable machine can save *you* sizeable chunks of time and money. Write today for our detailed bulletin.

MOORE SPECIAL TOOL COMPANY, INC. 734 Union Ave., Bridgeport 7, Conn.



ADD (TOOLROOM

JIG BORERS - JIG GRINDERS - PANTO-CRUSH WHEEL DRESSERS - DIE FLIPPERS - MOTORIZED CENTERS - HOLE LOCATION ACCESSORIES

MACHINE TOOL CATALOGS or write for copy



Just as a Negative guarantees you an exact duplication of a photograph, you are assured a

Positive Duplication of an original grinding wheel thru the CINCINNATI (PD) Manufacturing Process.

Cincinnati Grinding Wheels offer POSITIVE DUPLICATION

It's a fact! The CINCINNATI (PD) Manufacturing Process assures a Positive Duplication of the original wheel every time you reorder. And it's the greatest grinding wheel development in years—an achievement in precision manufacturing and quality control that will save you money and increase your production.

"On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike. Yet they are priced no higher than ordinary wheels.

Let us prove to you how CINCINNATI (PD) WHEELS can save you money and increase your production. Just contact us and we'll send one of our representatives—

men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



SGRAP that old hammer but SAVE THE ANVIL!

MOUNT A CECO-DROP UPPER-WORKS ON IT



To meet competition, your best bet is to scrap your old unproductive gravity drop hammers and install Ceco-Drops, the most modern, most pro-

ductive drop hammers ever built. And for quick changeover at minimum cost, you can have Ceco-Drop upper-works fitted to your present anvil. You have all the benefits of modernization without the time and expense of replacing the anvil or disturbing the foundation.

Write for Bulletin 57-L-4

CECO-DROP

Made by the BUILDERS of

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



These superior tools retain a sharp edge under high tempera-

tures and have excellent resistance to abrasion. Additional tool life and economy result from the use of the best hardened high speed steel bodies.

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street
Cleveland 14, Ohio
Stockrooms: New York 7 * Detroit 2 * Chicago 6 * Dallas 2 * San Francisco 5 * Los Angeles 38
E. P. Barrus, Ltd., London W. 3, England



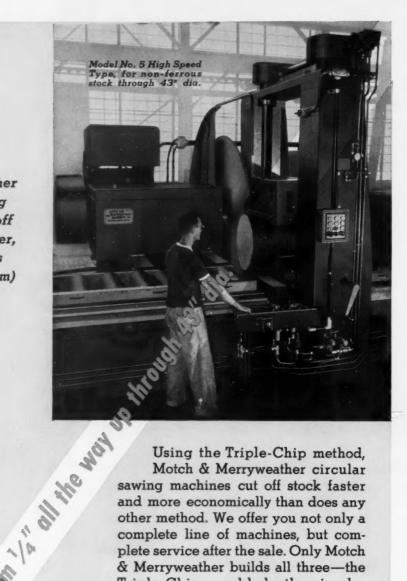
Request your copy of this descriptive new booklet on CLEVELAND Carbide Tipped Tools



TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

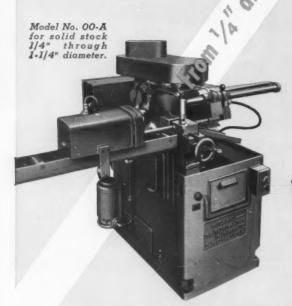
How complete is "complete"?

Motch & Merryweather builds circular sawing machines which cut off stock up to 43" diameter, ferrous or non-ferrous (titanium to magnesium) -rounds, squares, or structural shapes.





Using the Triple-Chip method. Motch & Merryweather circular sawing machines cut off stock faster and more economically than does any other method. We offer you not only a complete line of machines, but complete service after the sale. Only Motch & Merryweather builds all three—the Triple-Chip saw blade, the circular sawing machine which uses it, and automatic blade sharpeners to sharpen and re-sharpen at low cost.



MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines



Because of this self-aligning feature, loads on the Barrel Bearing are always ideally distributed over large areas of contact between races and rollers, with greatest load concentration at the strongest part of the rollers—at their major diameter. Roller ends cannot be overloaded.

But that's not all. The barrel shape of the rollers combines low rolling friction with high load-carrying capacity—making the Barrel Bearing ideal for a wide range of applications. And here's the clincher: this superior bearing is far less costly than you'd expect—thanks to a new manufacturing process used only by Hyatt.

Does that over it? You might think so, but it doesn't. There isn't enough space on this page to tell you everything about this new bearing. For full information, write to the address below.



ROLLER BEARINGS

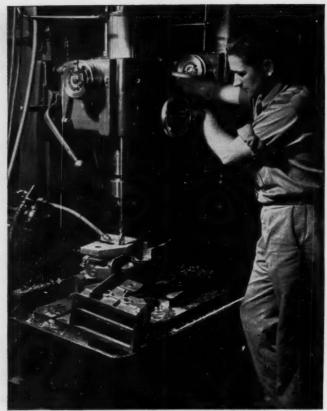
HYATT BEARINGS DIVISION . GENERAL MOTORS CORPORATION . HARRISON, N. J.



Cleereman Layout Drilling Machines



Cleereman Jig Borers



Cleereman Drilling Machines

Cleereman Upright Sliding Head Drilling Machines have earned a reputation second to none for precision, production and performance.

Cleereman Layout Drilling Machines are the ideal solution for filling the gap between drilling machines and jig borers on tool and production work with normal precision tolerances.

Cleereman Jig Borers are unexcelled for ultra-precision, operating facility and long life.

NOW ... at the touch of a button ---.

the new Cleereman "Series A" Upright Drilling and Tapping Machine automatically cycles. Quick set-up, universal adaptability, and the power to produce are basic features. Power rapid traverse approach and return to the spindle boost operating efficiency. Now, on multiple heads, gang drills or single spindle machines even small lot production can be handled with high volume ease.

Contact your local Cleereman distributor for catalog giving complete information, engineering data and specifications, or write direct to Cleereman Machine Tool Co., 640 West Washington Blvd., Chicago 6, Illinois.

CLEEREMAN NOW

CLEEREMAN

produces
the NEW
"SERIES A"

AUTOMATIC

DRILLING
AND TAPPING
MACHINE





Affiliated with

CLEEREMAN MACHINE TOOL COMPANY

Green Bay, Wisconsin

Builders of Precision Jig Borers and Drilling Machines





On any carbide grinding job ...

Nothing



Norton Vitrified Bonded Diamond Wheels

outperform all others of this type. They combine the fast cutting action of resinoid bonded wheels with resistance to grooving approaching that of metal bonded wheels. Great durability is another advantage, since the vitrified bond adheres to the diamond particles and holds each one tightly for maximum useful life.



Production Grinding of Single Point Carbide Tools is most economical and efficient with Norton vitrified bonded diamond wheels. Grinding chip breakers, as illustrated, is another important job for which they are ideal. One outstanding advantage is that they hold their corners exceptionally well.



Norton Resinoid Bonded Diamond Wheels

provide the fast cutting and long, money-saving wheel life that make them favorites for precision sharpening jobs. Made in two bond types — regular, for wet grinding and B6, for dry grinding. It is always more economical to use each bond type on the applications for which it is best suited, rather than to try to make one type serve for both wet and dry grinding.



On Your Multi-Tooth Grinding Jobs, Norton resinoid bonded wheels hold size so that each tooth gets the uniform grinding vital to good cutter performance. And in the straight, thin shapes permitted by the resinoid bond they make excellent cutoff wheels for salvaging damaged carbide tools.

cuts like a diamond

Diamond wheels in carbide grinding more than pay for themselves. "It's just like finding money."

You can cut grinding time — and grinding costs to the lowest possible by standardizing on Norton diamond wheels.

As a result of Norton Company's long pioneering† in diamond wheel development, Norton diamond wheels bring you a combination of long service life and efficient cutting action that means maximum economy — across the entire range of carbide grinding applications.

Besides the vitrified and resinoid bonded types shown here, Norton diamond wheels are also available in a metal bond — where durability and resistance to grooving, rather than a fast rate of cut, are primary considerations. For every application the proper size and type of Norton diamond wheels are available in a wide variety

of grit sizes. (For small-volume requirements, Norton K Bond CRYSTOLON* wheels are often the best investment. See illustrations.)

See Your Norton Distributor

for aid in selecting the right Norton wheels for every grinding job. And ask him for the 142-page, illustrated booklet: "Grinding Carbide Tools." Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. Listed under "Grinding Wheels" in your classified phone directory. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products ... to make other products better



Norton K Bond CRYSTOLON* Wheels

feature fast, cool cutting and exceptionally uniform performance. The vitrified K Bond permits half-grade increments of hardness, enabling you to "pin-point" your specifications. Use these wheels for roughing and backing off. Usually preferred in green CRYSTOLON, but also available in gray.



For Small-Volume Carbide Grinding, especially in single-point applications, the K Bond wheels offer outstanding economy. Their high stock removal rate and uniform performance assure quality grinding at lowest cost.



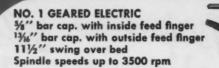
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries -†First with resinoid banded, first with metal banded, first with vitrified banded diamond wheels.

W-1579

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



NO. 3 UNIVERSAL

up to 71/2 HP

 $1\frac{1}{2}$ " or 2" bar cap. 15 $\frac{1}{2}$ " swing over bed

Spindle speeds up to 1825 rpm

NO. 2 GEARED ELECTRIC 1" or 11/4" bar cap. 13½" swing over bed (Available with "Autocycle" controls) Spindle speeds up to 2500 rpm

A Complete Line of Turret Lathes

Offering

Higher Speed . More Power Increased Rigidity . Improved Accuracy and Featuring

100% Anti-friction bearing, 12 speed geared headstocks

Precision heat treated alloy steel headstock gears and shafts

Flange type motor mounting (eliminates all belts and pulleys)

Optional collet chuck capacities

Fully enclosed, oil tight apron.

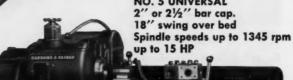
Solid alloy steel, replaceable bed ways on all Universal models

Hardened and ground steel turret slide and saddle ways, gibs and caps

Large diameter precision roller bearing turret mounting

Self compensating automatic turret clamp ring Large hardened and ground-in-thread ball bearing cross slide screw with alloy bronze and anti-backlash nut on Universal models

> NO. 5 UNIVERSAL 2" or 2½" bar cap. 18" swing over bed

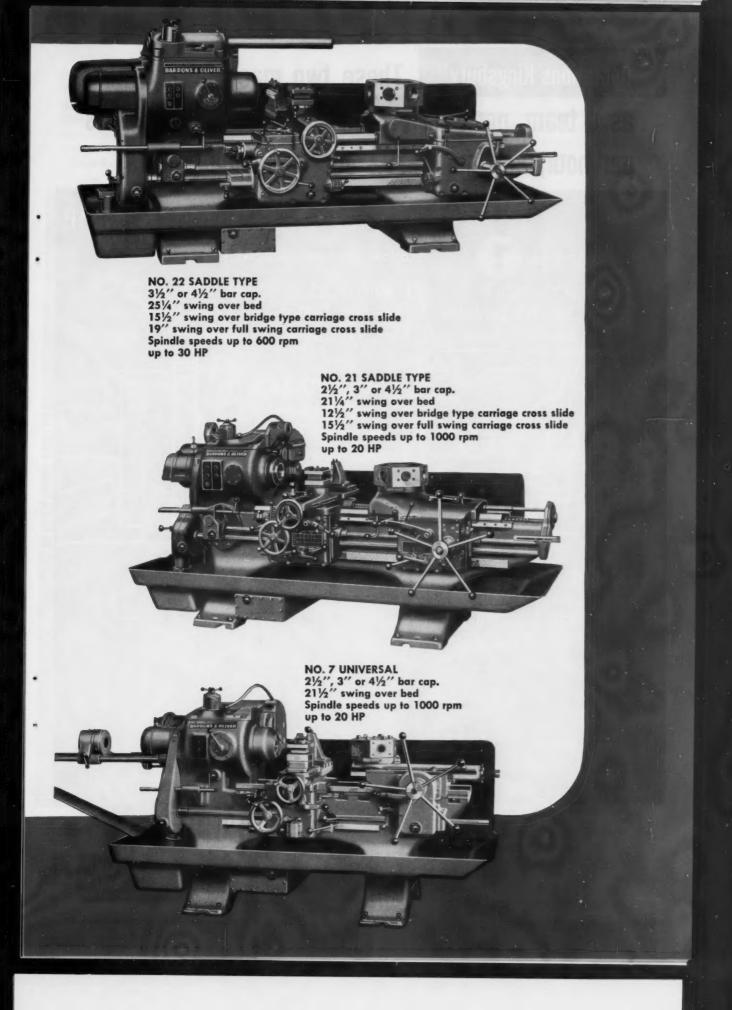




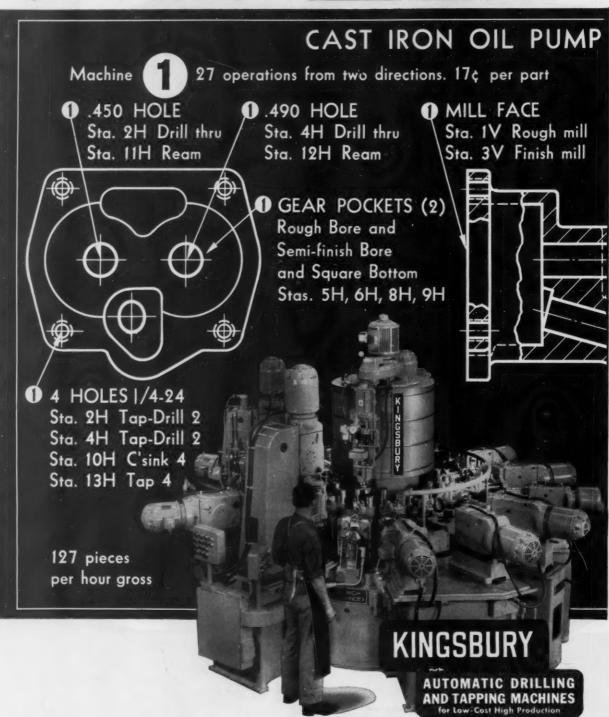
Write for complete information, specifying size and type of work.

1135 WEST 9TH STREET

CLEVELAND 13, OHIO



"Operations Kingsbury" These two machines, working as a team, perform an <u>average</u> of 3879 operations per hour, machining 102 <u>interchangeable</u> parts

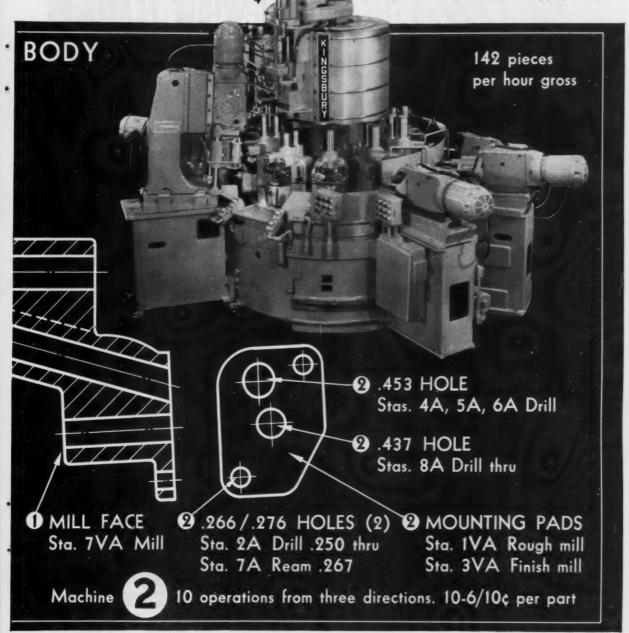


The blueprint tells only part of this Kingsbury story. The rest is told in Keene, New Hampshire, in one of the most modern machine tool plants in New England. Here Kingsbury engineers study your part specifications—for your Kingsbury must do the operations you require at the rate you name.

Each Kingsbury machine is custom-built,

but it is never built "from scratch." Even the work-holding fixtures, specially designed for each part, are developed from a background of years of experience and

knowledge of what is required for accuracy and safety — and what works. Every mechanism has been tested in field service. Standard Kingsbury bases, drilling, and tapping units,



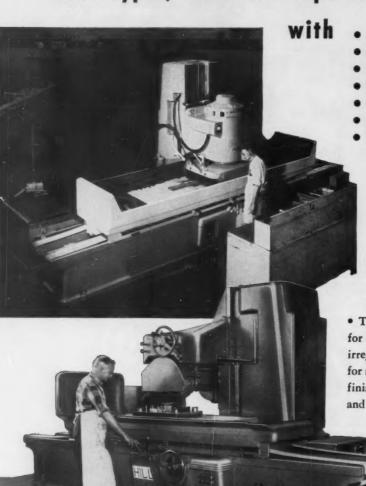
indexing mechanisms, lubricating and cutting-oil systems, electrical and mechanical controls . . . all are coordinated in an automatic machine which must perform correctly "first time round" — and year after year in your plant. Perhaps our *mental attitude* has a lot to do with the success of Kingsbury machines. We are

specialists. Since 1918 we have built more than 5,000 Kingsburys and we know what a Kingsbury can do. When we tell you a Kingsbury can do your job to your satisfaction, we're ready to prove it!

KINGSBURY MACHINE TOOL CORP. 108 Laurel Street, Keene, N. H.

WITH All THE WORTH-WHILE FEATURES

Two types, Horizontal Spindle or Vertical Spindle



• Open Side Accessibility

• 100% Hydraulic Table Drive

· Built-in Spindle Motor

• Centralized Assembly Controls

• Low Pressure Hydraulic System

• One Shot Lubrication

• Adequate Safety Devices

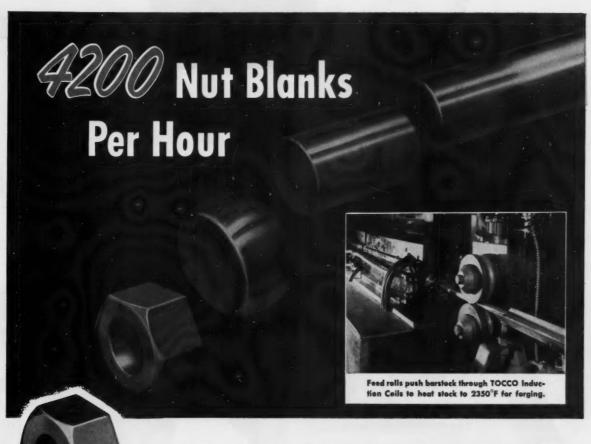
• The "HILL" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces—recommended for accuracy, speed and finish—features that mean increased precision production. Made in table widths of 18", 24" and 30" with table lengths from 5 to 20 feet.

• The "HILL" Horizontal Spindle Grinder for a wide range of grinding—flats, angles, irregular and special shaped surfaces—ideal for maintaining close tolerances with superior finish. Made in table widths of 18", 24", 30" and 36" with table lengths from 5 to 20 feet.



THE HILL ACME COMPANY

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING
TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES



with TOCCO*Induction Heating

FASTER PRODUCTION—4200 nut blanks per hour—twice the output of a conventional hot punching machine—that's the result of Lamson & Sessions Company's new automatic production set up with TOCCO Induction Heating.

OTHER ADVANTAGES—TOCCO delivers exact temperatures (2350°F, plus or minus 25°) and delivers them so fast that scale has little time to form. Scale loss has been reduced to only about 1% for hot-rolled stock. TOCCO is clean and cool, fits right into the production line—no hauling to and from the heattreat department—no unpleasant radiant heat to annoy workers.

HERE'S HOW IT WORKS—Steel bars up to 1½" diameter are fed through TOCCO Induction Coils. The first two coils, operating off a 300 kw, three kc TOCCO motor-generator set, preheat the rod. The third

coil which operates from a TOCCO 250 kw 10 kc generator then boosts the rod to forging temperature. The hot rod then is fed to the special hot nut former (designed and built by NATIONAL MACHINERY CO.) which shears the rod to suitable lengths, forms the part and spits out the nut blank—ready for tapping.

In your search to find sound methods of increasing production, improving products and lowering costs, don't overlook TOCCO Induction Heating. If your products require heat treating, soldering, brazing or forging, it will pay you to investigate TOCCO for better, faster ways of producing them at lower unit costs.

THE OHIO CRANKSHAFT COMPANY FREE BULLETIN THE OHIO CRANKSHAFT CO. Dept. M-11, Cleveland 1, Ohio Please send copy of "Typical Results of TOCCO Induction Heating for Forging." Name Position Company Address City Zone State

THESE MODERN

BLISS

STRAIGHT







Heavy bex type crewn, above, is reinforced with thick internal ribs front to back. Deep sections and large bearings provide rigid support for heavy SAE 1045 forged steel shaft, holds deflection to a minimum.

Air counterbalance, top right, maintains upward tension on main bearings—compensates for weight of dies, prevents backlash in gears, and eliminates takeup in main and connecting bearings when tension is reversed:

SIDE PRESSES ARE NOW

FIRST CHOICE

IN AMERICA'S METALWORKING PLANTS

About five years ago, we completely redesigned our single and double crank straight side press line-modernizing the line, complying with Joint Industry Conference standards, and adding many new features that resulted from careful study of user requirements.

While the presses were still in the blueprint stage, the news spread through industry. Relying only on the prints, enthusiastic customers volunteered enough orders to give one Bliss plant a four-month backlog before a single part was cast!

That enthusiastic acceptance is even greater todaywith good reason. From the crown down these modern, rugged-duty presses offer as standard equipment unique design features like these-

- The new presses are heavier, with deeper, thicker box sections...larger bed and slide areas.
- They feature the long barrel-type connection, making possible a range of slide adjustments 100% greater than prior standards.
- Gibbing is longer—slide is entirely within the gibs

during working portion of stroke, even when adjustment is down.

• New cool-running air clutch with longer wearing linings is standard on most sizes.

Thanks to these and other new features, Bliss straight side presses have been proved-in plant after plant-to hold their accuracy longer. They've been proved to render far longer die life...to minimize maintenance.

And yet their cost is less than you might think. To get the complete story on industry's most modern straight side presses, write today for copies of Bliss catalogs 17-D and 9-D. They're yours for the asking.

Want more information? Only the highlights of the Bliss straight side presses have been revealed here. For complete

description of the exclusive design features of industry's most wanted straight side presses, detailed specifications, and a full listing of the standard single and double crank presses available, write today for our catalogs 17-D and 9-D.



Remember: BLISS for Presses, Rolling Mills and Special Machinery





Motorized slide adjustment, above, with locking brake has fully-skirted sleeve and long bearing surface to insure support through full limit of adjustment .. eliminates need for ring risers and stools.

Friction plates, top right, on both clutch and brake are easily removed without disassembling clutch or removing it from press. This feature alone saves hours of maintenance time.



on your press is more than a name . . . it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio

Subsidiary: The Die Supply Company, Cleveland, O.

E. W. Bliss (England) Ltd., Derby • E. W. Bliss Co. (Paris) France U. S. Plants in Canton, Salem and Toledo, Ohio; Hastings, Michigan; and San Jose, Calif. Branch Offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, Washington, D. C. and Toronto, Canada.

Other representatives throughout the world.



"He who makes no mistakes does nothing"

In a supposedly modern era it is sometimes claimed to be "smart business" to let a competitor take the lead and make profit from his mistakes. Obviously, if all business adhered to such a philosophy there would be no progress, if any business. "He who makes no mistakes does nothing". Cone leadership was founded - and is maintained - by active service, by doing things.

The Conomatic Carbide Development program expects to make a few mistakes. But, loss or gain, its efforts will contribute to the general benefit of all "automatic" users, users on whom all "automatic" builders are dependent.

> The job illustrated compares actual production runs with HSS and 100% carbide tooling. It suggests the kind of pioneering that is being done at Cone.

> > Full details are available.



MATERIAL-1112 STEEL: Hole drilled with 1" dia. drill to 2¾" depth. OD threaded to 2" length with 1¼"-12 chasers.

	HSS	CARBIDE
Cycle Time	90 secs.	15 Secs.
Work Spindle Speed	370 R.P.M. at 103 S.F.	1500 R. P. M. at 417 S. F.
Tool Wear	1500 pcs. per grind	5000 pcs. per grind



Conomatic } Cone AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



TIGHTEN YOUR GRIP ON PRODUCTION

Production flows faster and smoother when your machine tools are equipped with Jacobs Chucks.

Rugged construction, great gripping power and accuracy have made The Jacobs Plain Bearing Drill Chuck the choice of machinists throughout the world.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A JACOBS IT HOLDS

Jacobs and your local distributor

are ready to deliver the chucks you need and the service you deserve.

- ... first in chucks
- ... first in service

Now's the time to discard costly, obsolete methods...replace with FEDERALS for



FEDERAL PLAN PRESSES

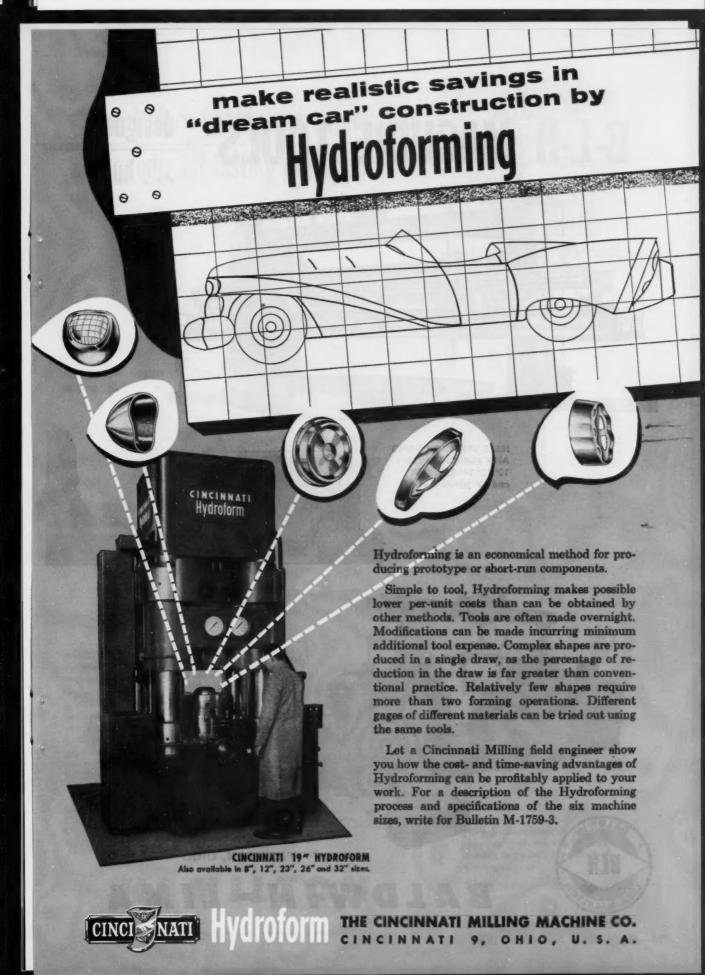


Write for new Dial Feed Catalog

THE FEDERAL PRESS COMPANY

50! Division Street, Elkhart, Indiana

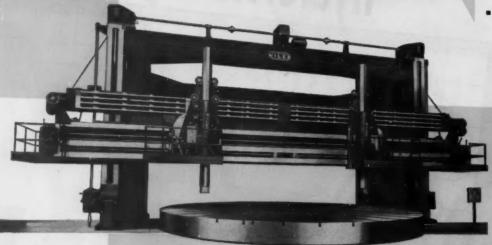
Don't let obsolete methods and equipment handicap your operation, drain your profits. Modernize with new Federal Dial Feed Presses. Then watch your production go up, and costs go down! Surveys show many a Federal Dial Feed doing three to five times the work of a standard press... cutting down-time, reducing accidents, eliminating more expensive equipment. These rugged, precision-built, versatile presses incorporate the finest materials and workmanship. Available in eight sizes, from 6 to 80 ton capacity. Automatic feeds and ejectors if desired.



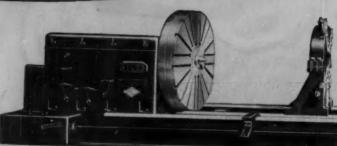
B-L-H MACHINE TOOLS

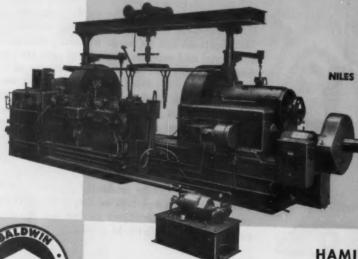
designed

. . built



NILES VERTICAL BORING AND TURNING MILLS— 10' 12' 14' 16' 20' 30' and 43' (shown above)





NILES RAILROAD TOOLS-

Hydraulic Car Wheel
Lathe (at left);
End Drive Axle
Lathe; Hydraulic
Centering Machine;
Hydraulic Diesel
and Car Wheel
Borers; Hydraulic
Axle Burnishing
Lathe



HAMILTON WORKS

BALDWIN - LIMA

for modern speeds and automation ruggedly for lasting precision

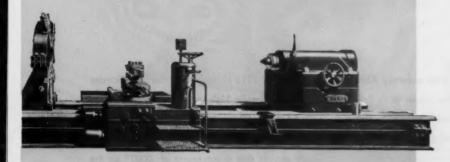
NILES

BORING MILLS ENGINE LATHES RAILROAD TOOLS



MECHANICAL PRESSES

NILES HEAVY ENGINE LATHES— 40", 50", 60", 72", 84", 96" and larger sizes



MAMILTON MECHANICAL PRESSES—

single, double and triple action presses for metal forming and stamping; also open back inclinable presses, rail presses, welding presses and die fitting machines.



- HAMILTON

Machine Tools see our 12-page catalog in Sweet's Machine Tool Catalogs . . . or

For full information on these B-L-H

Write us for your free copy.

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-77

TWO GREAT GRINDERS

From The Abrasive Line

EACH of these high-speed, high-accuracy Abrasive Surface Grinders is the leader in its field. The Abrasive No. 1½ hand feed grinder is the toolroom favorite. The No. 1218 Hydrabrasive Surface Grinder is "tops" for production and high-output gauge grinding.

Features of Abrasive No. 1½ include: big capacity (15" long x 10" wide x 12" high); utmost simplicity for quick set-up and fast production of short-run jobs; unit bed construction for maximum stability; conveniently located handwheels; optional location of elevating handwheel on either left or right side of wheelhead.

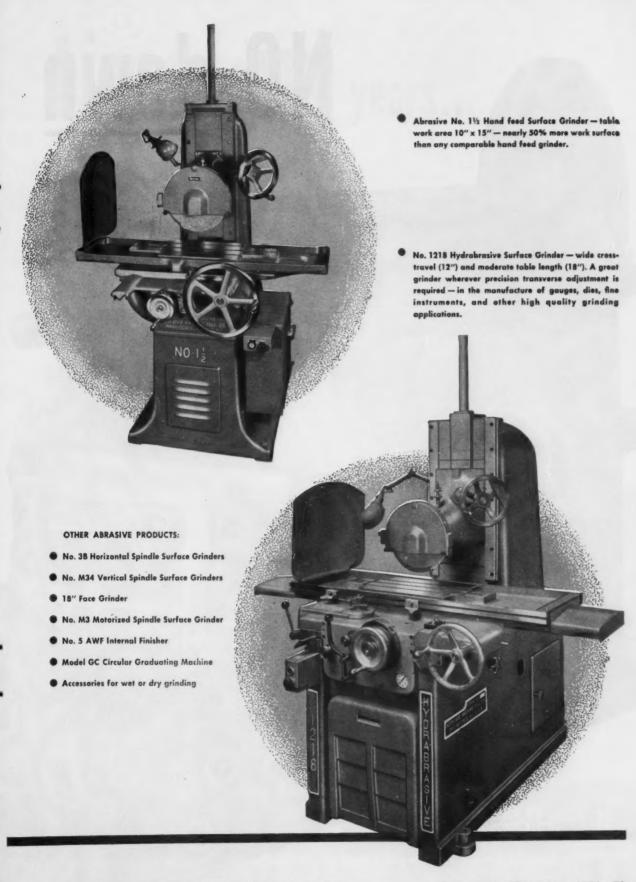
The No. 1218 Hydrabrasive Surface Grinder provides: hydraulic, high-speed table feeds, adjustable from ½ to 90 ft. per min. with ¾" of crossfeed in ½th of a second; special backlash eliminator which assures that a movement of .0001" on the crossfeed handwheel equals .0001" movement of the saddle; unitized design of hydraulic and mechanical components for easy accessibility and maintenance; conveniently located electrical control panel which fully meets J.I.C. codes.

We will gladly send you complete details on both of these modern surface grinders. Write for illustrated catalogs.

ABRASIVE MACHINE TOOL COMPANY
12 Dunellen Road, East Providence 14, R. I.



ABRASIVE QUALITY IS REFLECTED IN THE FINISH OF YOUR PRODUCT



NO down

CINCINNATI

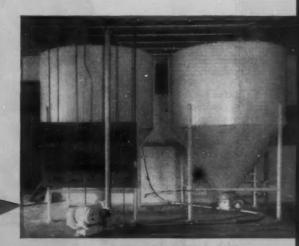
Photos courtesy Century Machine Company, 4434 Marburg Avenue, Cincinnati 9, Ohio

time in 16 years...

The records of the Century Machine Company show "no down time in sixteen years use" on this Cincinnati Press Brake.

This machine, working a 9½ hour day, forms light gauge sheets in mild and stainless steel up to ¼" thickness. It is constantly producing accurate parts for easy assembly of Century's baking ovens and bakery machinery.

Write for free Vinyl Plastic Tonnage chart TC-4 on your company's stationery.



 Flour Storage Bins—each 1000 lbs. capacity

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS . SHEARS . BRAKES



DRILLS FOR OIL . . .

with 32 LELAND-GIFFORD Crankshaft Drilling Machines

This Leland-Gifford Drilling Machine practically takes a crankshaft out of the operator's hands, drills six perfect oil holes in it, and then hands it back.

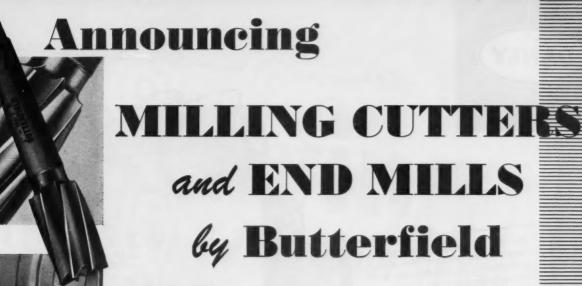
Actually, the operator slides the crankshaft in on rails. The Leland-Gifford Machine then positions and clamps it, turns on the coolant, drills the $\frac{1}{4}$ " x $5\frac{1}{2}$ " holes, then unclamps.

Six standard self-contained deep hole drilling units make up the complete ma-

chine. Each unit has its own feed rate, overload protection (will back out if the drill gets dull) and source of pressure. Individual units may be removed and replaced with no pipes to disconnect.

No better endorsement of Leland-Gifford Crankshaft Drilling Machines could be made than to report that the same manufacturer has just ordered additional units.





With the addition of Milling Cutters and End Mills, Butterfield now offers a full line of metal cutting tools. Milling Cutters and End Mills are made to the same exacting standards of dependability and extra performance which mark Butterfield's Taps, Dies, Drills, Reamers, Counterbores, and Screw Plates.



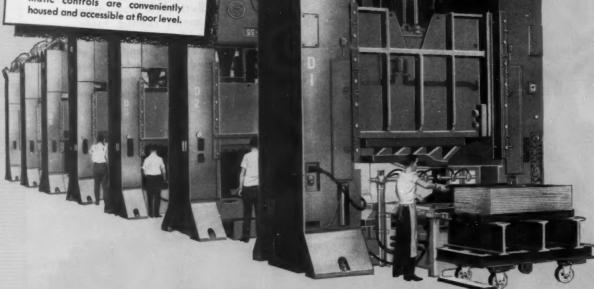
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U.S.A.

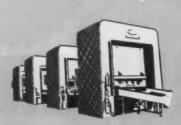
TAPS - DIES - DRILLS - REAMERS - COUNTERBORES - SCREW PLATES - MILLING CUTTERS - END MILLS

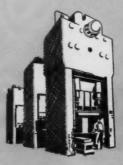
CALL YOUR
BUTTERFIELD
DISTRIBUTOR



This line of Danly Presses represents the most advanced thought in press engineering. Completely enclosed integral controls simplify installation, make operation more flexible. Both electrical and pneumatic controls are conveniently housed and accessible at floor level.









Danly affers any press you need for blanking, drawing or any secendary operation . . . single, double or triple action . . . overdrive or underdrive . . . to suit your plant layout. Make your press line a

Drawing COSTS LESS ON A DANLY PRESS

When you get a tough draw job . . . put it on a Danly

Danly Presses reduce the cost of your drawing operations by producing more stampings per shift. Their proved mechanical worth adds up to greater production, fewer shutdowns.

The line of Danly Underdrive Presses below is headed by a Triple Action Danly that actually doubles production. Eliminating what is normally a choke point, this Danly draw press is equipped with a special slide motion that permits faster stroking without exceeding safe drawing speeds. The output from this press keeps the whole line of secondary operation presses working steadily at full capacity.

At the left is another line of Danly Presses headed

by a top drive double action draw press. This line represents the most advanced thought in press represents the most advanced thought in present engineering. Totally enclosed and integral controls make installation practically a "plug-in" job. Operation is easier, safer-less maintenance

All Danly Presses are built heavier to stand up under continuous peak load operation. Automatic oil lubrication adds hours of production time to every working day. No matter what your stamping requirements are, Danly Presses will reduce your costs. Call a Danly press engineer today.

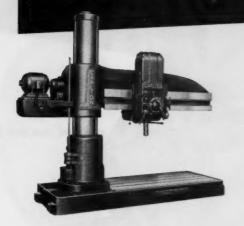
DANLY MACHINE SPECIALTIES, INC.





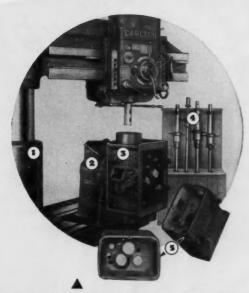
RADIAL DRILLS ...

plus Carlton engineered tooling produce the accuracy, uniformity and interchangeability of parts indispensable for production line assembly



• More perfect parts speed up production line assembly. Carlton radial drills, properly tooled, give you perfect hole drilling-and frequently effect substantial savings by eliminating unnecessary operations.

Carlton engineers will be glad to work with your engineers in recommending the best Carlton radial drill and the most efficient tooling for your requirements. No obligation, naturally. Why not write us today?



Transmission body casting: Present running and set-up time: 5.25 hours. Previously: 7 hours. The set-up: (1) Carlton 3-A radial drill,

(2) master trunnion.

(3) jig, (4) boring bars,

(5) transmission body casting. 25% savings effected by eliminating boring operation previously done in a horizontal plane.



Full Universal Table with 32" round top. Carlton engineered and produced. Anti-friction mounted for easy operation. Handy table for drilling compound angles which heretofore required more complicated set-ups. Permits drilling on five sides of a workpiece without changing set-up. Available for use on any Carlton radial drill.

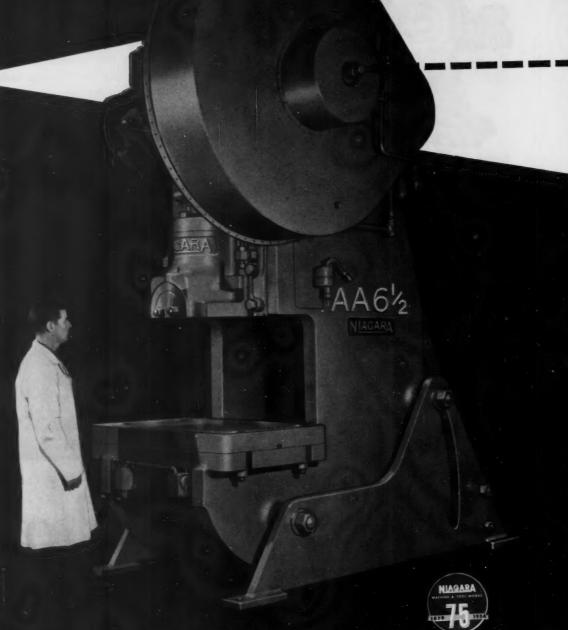


THE CARLTON MACHINE TOOL CO. Cincinnati 25, Ohio, U.S.A.

For more information on products advertised, use Inquiry Card, page 265

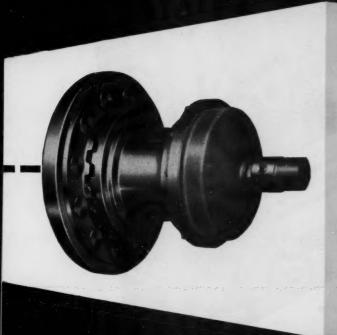
MACHINERY, November, 1954-87

ITS HERE!





.. a great, new line of inclinable presses



FEATURING the <u>exclusive</u> Niagara Electro-Pneumatic Clutch

- Combines prime advantages of friction and mechanical sleeve clutches.
- Has no friction surfaces to slip, heat or wear.
- Provides a positive drive that engages or disengages instantly, at any point in stroke.
- Can be single-stroked, jogged or run continuously.
- Operates effortlessly by palm buttons or foot switch.
- Stops automatically if power or air pressure fails an important safety feature.

Never before in O. B. I. Press history, has there been so significant a development as this new Niagara line . . . Series AA. Built in eight sizes, with shaft diameters from 3 to 7 ½ inches, it has set a new high for performance and stamina in blanking, forming, drawing, perforating, combination die and automatic feeding operations.

Get the complete story. Send for literature. Talk with our representative. SEE the press in action. Compare! Then, decide. AND YOU'LL FIND ALL THE FACTS IN HERE! BULLETIN 57-A Sent free ... promptly!



America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

NIAGARA MACHINE & TOOL WORKS . BUFFALO 11, N. Y.

DISTRICT OFFICES: DETROIT * CLEVELAND * NEW YORK * PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries



Here is another example of the high production attainable while grinding to extremely close tolerances with Blanchard Surface Grinders and Blanchard Wheels.

Now, these highly desirable results are obtained, using a No. 42-72-84 Blanchard Surface Grinder—nine are placed on the chuck and ground on 6 sides, removing .015" from each surface, parallel to .001", flat within .001" with surface finish of 5 micro-inches. The Blanchard cut time to 9 hours, floor-to-floor!

No wonder production men say: "Put it on the Blanchard — it takes less time to do a better job".



This is the largest Blanchard Surface Grinder, No. 42-72-84.



Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

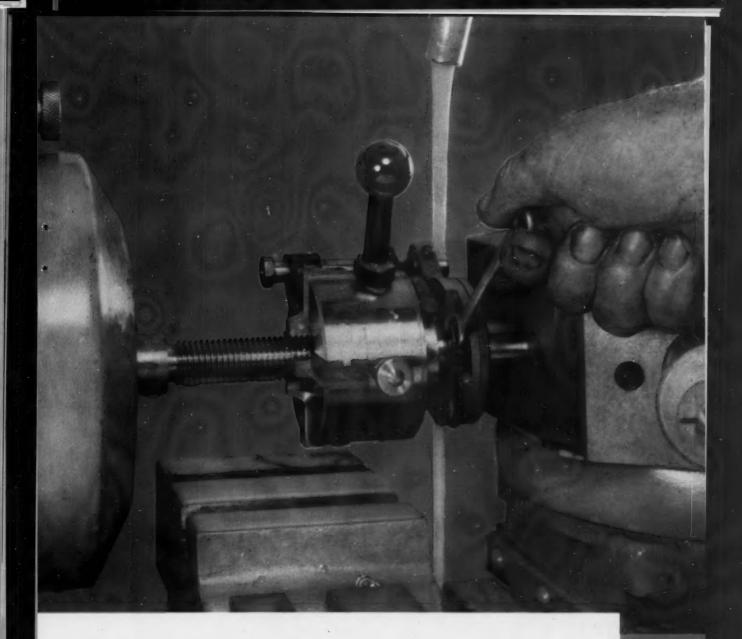
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

90-Machinery, November, 1954

For more information on products advertised, use inquiry Card, page 265



MISALIGNMENT EASILY CORRECTED

Misalignment is a serious matter in threading and should be rectified as soon as possible. With the GEOMETRIC DS Head, however, uninterrupted production may be maintained on slightly misaligned jobs until permanent adjustment can be conveniently made.

By loosening two "back screws" on the ALIGNING SHANK, the head is allowed to float. A true-running work blank may then be threaded and the head, thus aligned, retightened with the "back screws."

Write for full details. Specify Bulletin DS

Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

NEW HAVEN 15, CONNECTICUT





EFFECTIVE-EFFICIENT* aye, and ECONOMICAL.

PARALLOC Dial Snap Gages

With a remarkable new type of pin locking mechanism that minimizes "outof-parallelism" between anvil faces. "L" Type fully encased, with set-back indicator and handle, permitting entry into narrow recesses. Wide choice of indicators as for "D" Type.



"L" (LEVER) TYPE

8 SIZES, each with 1/2" range, cover over-all range 0" to 4"



8 SIZES, each with 1" range, cover over-all range 0" to 8"

DuBo Gages

SINGLE END Sizes over 1.510"

DOUBLE END Sizes under 1.510"



Whether handle will drop freely or not shows "Go" or "NoGo". Finger-

tip operation reveals internal bore conditions by sensitive "feel". Tells more, more easily, than ordinary plug gages.

DIAL **Bore Gages**

10 SIZES

cover range from

1/8″_{to} 24″*)*

PATENT APPLIED FOR

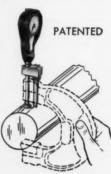


Three new models extend dial bore gaging range by intermediate steps down to 1/8" diameter. Each utilizes STAND-ARD's new, highly practical CENTERING-SIZE DISC principle. Simple in design, easy to set, easy to use; amazingly accurate and effective in small bore gaging.

Dializers®

STANDARD's original device for converting AGD Adjustable Limit Snap Gages to DIAL Snap Gages. Wide range of indicators from 11/8" to 21/4" diameter, graduations of .001", .0001", .0005" and .00025", and a wide variety of dial markings, including metric.

> Available separately for your frames or assembled in AGD frames supplied by us.



DIAL INDICATORS TO



A complete range of sizes and mountings, with any desired graduation; regular, metric or Decimatic . all completely shockproof.

EFFICIENCY EASE OF HANDLING • EASE OF READING . LONG SERVICE LIFE

 REDUCTION OF FALSE REJECTS

Write for "NEWS"; get full details of new STANDARD instruments that speed preduction and save you time, money and worry.



**PROPER and timely replacement or expansion of capital assets is the backbone of profitable operation of any business. Cherry-Burrell, therefore, has definite written policies and standards which are designed to make the most profitable use of capital funds available. Competing demands for these funds are judged, basically, on the basis of the MAPI formula. Every request for a capital expenditure over a rather small minimum must be accompanied by such an analysis. These analyses are made, furthermore, at periodic intervals on all capital equipment to determine whether that particular unit could profitably be replaced.

"Each division of the company submits, twice yearly, a Fixed Assets Budget Proposal. These are screened and summarized by the Vice President-Operations, who reviews them with the President, who then makes an overall budget request of the Board of Directors. The resulting fixed asset budget is then returned to each operating division. At every stage the MAPI analysis of each project is available and is used to help determine relative priorities.

"Our sales department suggests similar analysis to our customers in order that we may help them make certain that their uses of capital equipment are correctly evaluated and that replacements are made on an economically sound basis.

"By means of a dynamic equipment replacement program, American industry will be stronger and better able to meet whatever the future may bring, and give the American consumer better products at lower costs and with greater profit.

"For this reason the more realistic depreciation policies written into the Internal Revenue Code of 1954 and further liberalization of allowances in future legislation would benefit both the consumer and the producer."

JOHN G. CHERRY, PRESIDENT CHERRY-BURRELL CORP. CHICAGO, ILLINOIS

 $\rightarrow \rightarrow \rightarrow \rightarrow$

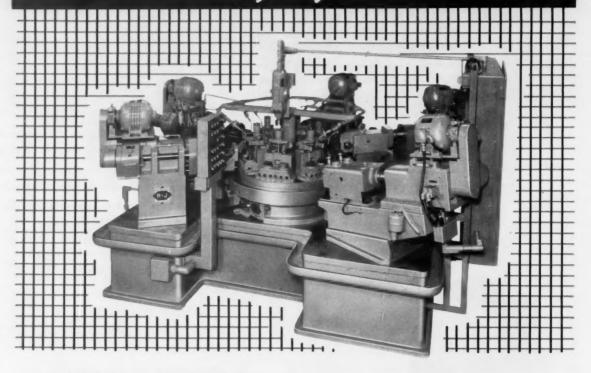
how CHERRY-BURRELL
has taken the guess-work
out of equipment
replacement

Metal-Working
Production Ideas...Be Well
Informed When the Time for
Replacement Arrives.....

ROCKFORD INSERT GROUP

November, 1954

Rehnberg-Jacobson



12 DRILLED HOLES and 4 SAWED SLOTS in 327 AUTO ENGINE PISTONS per HOUR



This is the piston, from a well-known new automobile engine, which has expansion slots in the skirt that are cut on the machine shown above. Rated production is 327 pieces per hour.

While most of the operations on automobile parts are standard in nature, there are a few cuts that might be called "different." One of these is the milling of expansion slots in piston skirts, as illustrated here. We recently delivered a machine, shown above, which handles this job rapidly and efficiently. The machine is an uncomplicated one, as can be seen, consisting of an automatic ALL-MECHANICAL Rim-Ball Index Unit surrounded by five ALL-MECHANICAL R-J Drilling Units and Milling Units for the necessary drilling and saw-

ing. The fixtures are of the A/B type where the piston is turned 180° and sent around again in the second position to machine the other side. Fast-acting, automatic, power-operated clamping and unclamping of the fixtures helps the operator to unload, switch, and load the parts in the short 11-second cycle period. In addition to 4 clearance holes for the sawed slots, the machine drills 4 odd oil holes into the wrist pin bushings, and 4 smoke holes in the bottom ring slot. If you have work of any comparable nature, let us quote on your needs.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY



2135 KISHWAUKEE ST. ROCKFORD, ILLINOIS



Machinery, November, 1954

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.

GREENLEE TRANSFER MACHINES

In the course of pioneering development of automatic transfer machines for mass production since 1935, Greenlee has introduced various outstanding elements and methods...

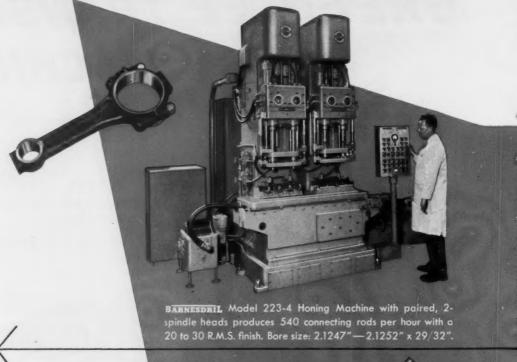
- Mechanical Features, such as: a raise-andcarry transfer system, patented individual lead screw tapping, automatic chip removal, all heads designed for preset tools, accessibility of all stations, and hardened and ground steel ways.
- JIC Standards throughout, on all hydraulic, electrical, and air-operated units.
- Workpiece automatically handled through all stations.
- Safety provisions, including electrical interlock of all units.
- Automatic lubrication, selected for each part of the machine.

GREENLEE BROS. & CO., 1871 Mason Ave., Rockford, Illinois





the Automotive Industry uses



HONING . . .

HONING EQUIPMENT FEATURES

Plugmatic Sizing

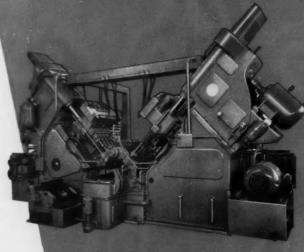
The Plugmatic gauging member sizes the bore being honed. Is self-aligning and not affected by misalignment or eccentric stone wear. Guarantees bore-to-bore accuracy within a few "tenths" and complete interchangeability of parts.

Electronic Hone Expansion Control

Operates automatically to keep the honing operation at peak efficiency and compensate for stone wear.

"Extra-Deep" Plas-T-Clad Stones

Provide 200 to 500% more usable abrasive and more positive support closer to the cutting edge . . . freer cutting action. Longer abrasive life means less down-time.



BARNESDRIL Model 320 Duplex Angle Honing Machine, with Electronic Hone Expansion, Plugmatic Bore-To-Bore sizing, two 4-spindle auxiliary heads and transfer fixture. Used for honing 8-cylinder V-type automotive blocks.

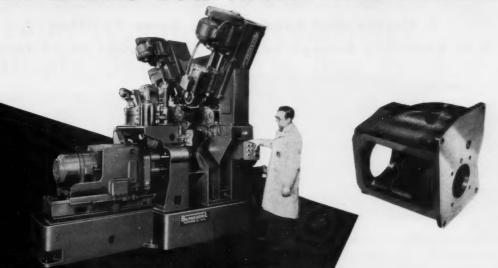


Machinery, November, 1954

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

BARNESDRIL

MACHINES FOR HIGH PRODUCTION



BARNESDRIL Special Hydraulic Unit Type Machine for drilling, chamfering, reaming, facing and tapping cast-iron transmission cases.



UNIT-MACHINE FEATURES

Flexibility

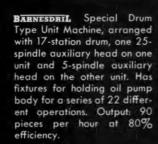
Production unit-machining offers flexibility on high runs of identical pieces . . . or, several different pieces at the same time.

Variety

A wide variety of machining operations can be performed in sequence, including drilling, reaming, counterboring, spot-facing, tapping and milling.

Automatic Cycling

Barnesdril engineers will arrange almost any number of operations into a single automatic cycle to provide the required output at the lowest possible unit-cost . . . with constant duplication assured at all times.





BARNES DRILL CO.

820 CHESTNUT STREET . ROCKFORD, ILLINOIS

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S. A.

This Anderson

HYDRAULI POWERPRESS

★ Checks and Bends in the Same Position
★ Is Sensitive Enough to Bend Shafts .001 of an Inch

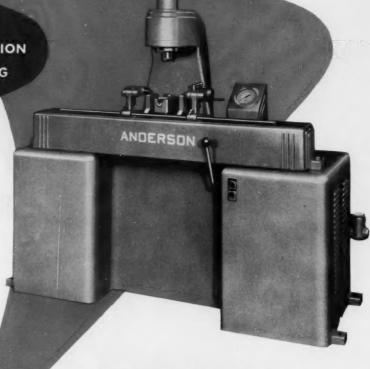
PROFIT FROM
LOW-COST, HIGH-PRODUCTION
Precision STRAIGHTENING

Anderson modern high-speed power presses are used for straightening, checking, testing, stamping, numbering, riveting, and other like operations. Both stationary and traveling ram models of presses are extremely flexible and quickly and accurately controlled by a unique rotary control valve. An easily read pressure gauge, indicating ram loading, is conveniently mounted near the work, increasing production and assuring precision. The hydraulic unit is pushbutton controlled for efficient operation.

ENGINEERING ASSISTANCE

Send us prints of your work and details of your operation. We will gladly make recommendations. No charge . . no obligation.





STATIONARY RAM TYPE

The Anderson Press illustrated above is the Stationary Ram type. The length of the work table is 60 inches. Floor space required 26" x 75", weight 2100 pounds. This press and the Anderson Traveling Ram Presses can be equipped with checking rolls, spring loaded centers, adjustable anvils, and indicators. To speed production, adjustable stop collars may be used to limit the stroke of the ram. Handoperated control equipment is standard, but extra provision can be made for foot operation where needed. Write today for Anderson's New Bulletin on Power Presses.

ANDERSON BROS. MFG. CO.

1907 KISHWAUKEE STREET . ROCKFORD, ILLINOIS



Special Cutters-

Greater Economy by Combining Multiple Operations in One Pass



In one pass, a gang of five specially designed Ingersoll roughing cutters with carbide-tipped blades completely machines lobe of diesel locomotive blower rotor.

Ingersoll Special Cutters are individually designed to meet the exact requirements of many complex milling and boring operations. For performance and economy, these cutting tools have low-cost replacement blades and are designed to permit use of cutter gangs or combination tools to do several operations in one pass.

While Ingersoll produces a wide variety of standard inserted blade milling and boring cutters, the design and manufacture of special cutters is a substantial part of the company's business. Ingersoll offers you the benefits of modern, efficient production equipment and 65 years of experience in building good cutters economically.

Ingersoll cutter engineers will study details of your work and recommend Special Cutters to answer your specific production needs.



608 describing Ingersell inserted blade special culters, the complete line of standard cutters and recommended cutter grinds.

THE

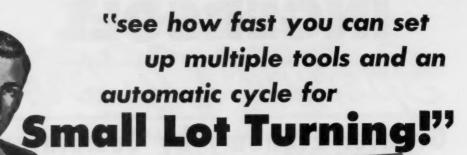
INGERSOLL

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES $\frac{SHEAR}{CLEAR}, \text{ cutters}$

MILLING MACHINE COMPANY

ROCKFORD, ILLINOIS, U.S.A.





"Watch Me Set-up This Sundstrand Automatic Lathe in 30 Minutes"*

*(Time is for an average job using 4 front tools for turning and 3 rear tools for facing.)



Placing master sample in machine.



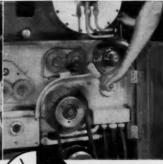
Setting control dogs.



Positioning rear tool blocks



Selecting correct feeds and speeds.



Running through cycle by hand crank.

AUTOMATIC LATHES I SIMPLEX RIGIDMILS I DUPLEX RIGIDMILS

SUNDSTRAND

"Engineered
"Production"
Service*









"They clocked me twice in setting up this particular job...checked and double checked my time... then added 10 minutes — I actually did it in 20 but they figured, being did it in 20, but they figured, being did it in 20, but they figured, being a demonstrator, I would have a little edge on speed. But, as you can see, it's relatively simple to do it in 30 minutes. You, or your machine operator could do it in this time without much practice. without much practice.

"Here are the most important steps in making a set-up for a 7-tool job."

Here's how it's done . . .



Disconnecting rear tool slide and removing tool relief blocks.



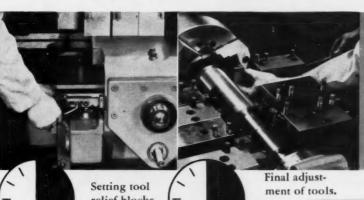
Positioning front tools around master sample.



Set front carriage dwell.



Adjusting rear slide to front dwell position.



relief blocks.



"Here's how this and other

time-saving features can reduce your turning time."

reduce your turning time."

A more detailed description of procedure in setting up Sundstrand Automatic Lathes is given in this new booklet. Also described are on-the-job installations complete with tooling diagrams and illustrations. Write for your copy today. Ask for bulletin 6-9.



SUNDSTRAND Machine Tool Co.

2530 Eleventh St. . Rockford, III., U.S.A.



SPECIAL MACHINES

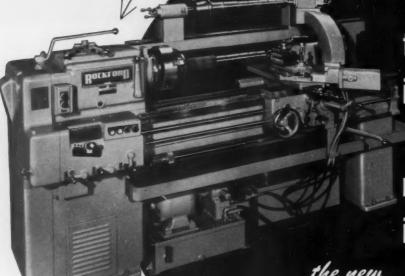






MEDIUM-SIZED ECONOMY-PRICED

DOES IT AGAIN



the most value in a tracer-lathewith medium capital investment

the new

ROCKFORD TRACER-LATHE

combines famous Rockford Features

with

Be sure to see this new production tool in operation. Witness the unusual accuracy and speed with which it cuts. Feel the ruggedness and power built into the Kopy Kat with the extremely sensitive feathertouch of the servo-mechanism control. Yet the cutting tool works with 400 lbs. unit pressure for positive finish and accuracy.

See your Rockford Machine Tool Co. representative today and have him arrange an appointment for you to see the new Rockford Tracer Lathe in action.

Unusual Tracer Sensitivity and Accuracy

Overhead Tracer Control Uses Either Production Sample or Flat

Self-contained, Easily Accessible Hydraulic Unit

Universal Cutting Slide with Positive Lock-Out for Manual Cutting

Four Position Turret Tool Post on Compound

ROCKFORD ECONOMY LATHES

6', 8', 10', 12' BEDS

18" Swing

MEDIUM-SIZED

ECONOMY-PRICED

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET, ROCKFORD, ILLINOIS



Machinery, November, 1954

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.



what size broach do you need?

American
HAS THE ANSWER

American makes all three— Broaches, Fixtures, Machines

Whether it is a large involute spline broach or a small round broach, you stand a better chance of getting a broach fitted to your needs when you specify American.

American builds all three — tools, fixtures and machines.

When you bring your broaching problem to them they approach it from the over-all view.

For American's quotation on your broaching problem, send a part-print and hourly requirements today.



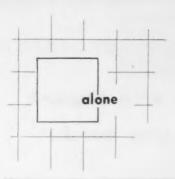
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan
See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

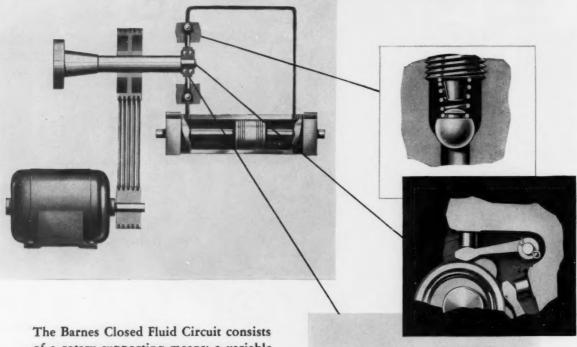


Machinery, November, 1954

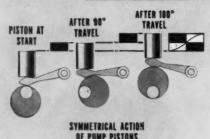




BARNES closed fluid circuit and drive



The Barnes Closed Fluid Circuit consists of a rotary supporting means; a variable displacement pumping arrangement synchronously driven from the rotary means; and a driving arrangement, including means for connecting and disconnecting the rotation of the rotary means, which causes the displacement pump to operate automatically and synchronously with the rotary supporting means.



BRANCH OFFICES

503 New Center Building Detroit 2, Michigan 3254 Lincoln Avenue Chicago 13, Illinois 132 East Hanover Street Trenton 8, New Jersey

SALES REPRESENTATIVES

Rees Machinery Company 1012 Empire Building Pittsburgh 22, Pennsylvania B. W. Rogers Company 850 South High Street Akron 9, Ohlo Standard Machine & Tool Co, 870 Ottawa Street Windsor, Ontario, Canada W. H. Del Mar Co., 3931 W. Slawson Ave. Los Angeles 43, California

Copyright 1953 by John S. Barnes Corporation

JOHN S. BARNES CORPORATION . ROCKFORD, ILLINOIS



Machinery, November, 1954

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.

Downtime BECOMES

Production Time

with the

NEW MATTISON DUPLEX

Take a look

2 Operators
2 Standard Grinders
500 Pieces

1 Operator 1 Mattison Duplex 500 Pieces



They say "The pieces being ground in these pictures are Maxel steel shanks for carbide-tipped milling cutter blades.

On these particular blade shanks, .050 stock is removed on the Mattison Duplex. A wide variety of blades and shanks are ground on this machine, with stock removal ranging from .020 to .200.

The two Mattison Duplex machines which replaced three single-table standard type grinders are doing more work than the three replaced machines. By placing a single ring of blades around the outside of the 30" diameter chuck, the operator is able to maintain continuous grinding. If more blades were put on the table at one time, the blades on the other table would be finished before he was ready to unload them.

The time saving in rough grinding these blades on the new Duplex machines is 50 per cent, compared with the old machines. In other words, 500 blades can be produced in half the time formerly required. Greater power and faster action account for some of this difference.



The new Mattison Duplex Grinder is really two machines in one, being equipped with two rotary tables or chucks instead of one. On many classes of work, one operator with this machine can turn out as much work as was formerly done by two machines and two operators. See example to the left. Downtime is practically eliminated.

An analysis of your grinding work will very likely disclose many jobs that could be very profitably handled on a Mattison Duplex. For further information write for a free copy of 145-3RM our new circular on this machine.

MATTISON

MACHINE WORKS

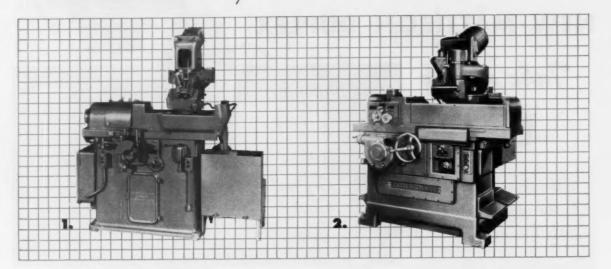
ROCKFORD · ILLINOIS

Machinery, November, 1954



AUTOMATIC HOB SHARPENING

the efficient way



Barber-Colman Sharpening Applicable to All Hobs and Form-Relieved Cutters

Sharpening is the one element of hob accuracy which the user must maintain. For high production sharpening or for small, job-lot sharpening, the most economical and most accurate method is the Barber-Colman method. Three machines cover the size range of your work and the price range for your specific requirements. One of these three automatic machines, the No. 4-4, No. 6-5 or No. 10-12, will do your job cheaper, faster and more accurately than can be done by any other method.

Keep Tool Maintenance On A Production Basis

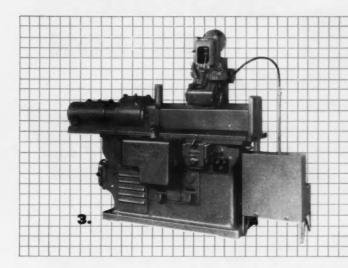
Positive mechanical control over all sharpening factors takes the human element out of resharpening hobs and formed cutters. It is the efficient way to sharpen these tools because it puts sharpening on a production basis and automatically produces uniformity, reduces sharpening time, and saves the operator's time for other duties. Spacing, lead of gash and radialism are held within the tolerances for any accuracy classification, including Class AA. Any hob or formed cutter can be sharpened on one of these automatic sharpening machines.

All Barber-Colman hobs and form-relieved cutters are sharpened on these machines. Because of their accuracy and ease of operation, these machines are also used by most competitive hob manufacturers for sharpening their hobs. Tolerances for the specific class of hob are easily held, and one operator can operate several machines. Once the necessary set-up is made, sharpening proceeds automatically without further attention from the operator.

BUILDERS OF PRECISION GEAF



TO MAINTAIN HOBS AND PROLONG CUTTING LIFE



- 1. He. 4-4 Automatic Sharpening Machine. High Production, Fixed Stroke. Work 4" Diameter, 4" Length. Wet Grinding Optional (Shown).
- No. 6-5 Automatic Sharpening Machine. Adjustable Table Stroke for Maximum Production. Wet Grinding Standard. Work 6" Diameter, 5" Length.
- 3. No. 10-12 Automatic Sharpening Machine. Adjustable Table Stroke for Maximum Production. Large Work up to 10" Diameter, 12" Length. Wet Grinding Optional.

New Features Step-Up Sharpening Production, Versatility and Convenience

With costs a vital factor in maintaining competitive position, many new features and improvements in Barber-Colman Automatic Sharpening machines will help you place man-hours and tool costs on a competitive basis.

Wet grinding is an ideal arrangement for sharpening carbide tools, and also permits higher sharpening feeds on high-speed steel tools. It is optional on No. 4-4 and No. 10-12 machines, but is standard equipment on the No. 6-5 Sharpener.

Adjustable stroke increases convenience and sharpening speed. This is a standard feature on both the No. 6-5 and No. 10-12 machines. New wheel spindle, work spindle and tail center designs have been incorporated in all machines for increased accuracy, convenience and output.

Check these new features for sharpening efficiency on your production operations and cost-reduction in tool programs. For full details on the complete line of Automatic Sharpening Machines, see your Barber-Colman representative or write direct to Automatic Hob Sharpening.

Complete data on cause and effect of hob sharpening errors, as well as detection and correction of such errors is contained in this recent issue of Hobbing Notes. Write for Vol. XI, No. 1 on your company letterhead and we will mail you a copy promptly.



HOBS • CUTTERS • REAMERS

HOBBING MACHINES

HOB SHARPENING MACHINES



Barber-Colman Company

GENERAL OFFICES AND PLANT, 6211 ROCK STREET, ROCKFORD, ILL.

HOBS AND MACHINES SINCE 1911

Machinery, November, 1954



MAKING THE CHIPS FLY

ON BIG MACHINED-FROM - SOLID ALUMINUM PARTS FOR AIRCRAFT

EKSTROM, CARLSON No. 400

CAV-RO-MIL

and the result...



This new machine is truly astonishing in its performance... those who have seen it in action have marveled at the cloud of chips it throws, at its accuracy, and at the extreme ease of operation. It is specially designed to meet the needs of today's... and tomorrow's... aircraft design and production.

MORE ACT

The cutter is driven at either 3600 rpm or 7200 rpm by a directconnected hi-cycle motor in the head. Above the head is a retractable follower pin that engages the template attached to the "ceiling", to determine the travel of the head and production of the required cavities. The rigidity of the head and follower permits highproduction milling within close tolerances.

CONTROLLED BY SIMPLE "JOY STICK"

Travel of the head in all directions and at variable speeds is entirely controlled by a single lever on the pedestal. Normal maximum traverse speed is 120 inches per minute. Both pieces shown were cavity milled and contoured and the lower piece was also skin milled. These parts are produced on this machine in 1/3 the time required by ordinary methods.

Write for further details.

EKSTROM, CARLSON & CO. 1400 RAILROAD AVE., DEPT. M 4 ROCKFORD, ILL.



FOR GREATER AIRCRAFT PRODUCTION!

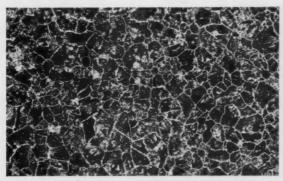


Machinery, November, 1954

4 reasons why TIMKEN® steel machining bars give you such uniform machinability



1. IN JUST 40 SECONDS this spectrometer tells us the exact chemical composition of a heat of Timken® steel. Results are flashed back to the furnace so the melter can keep close control of the analysis. This carefully-controlled chemistry produces uniform composition from heat to heat—a positive help in maintaining constant machinability.



3. UNIFORM GRAIN SIZE of every heat is assured by spectrometric or microscopic examination. This is another example of the many ways the Timken Company controls uniformity at every step in production.



2. INDIVIDUAL HANDLING of each order enables us to adjust our conditioning procedure to suit your machining requirements. Here bars are stamped to identify the heat and ingot they came from. It's one way we can limit variation within an order as well as from order to order.



4. ANY SURFACE DEFECTS are located and removed before your order is rolled to the required bar size. It's one more step we take to make sure Timken steel machining bars give you uniform machinability. To get all these advantages, specify Timken steel machining bars the next time you order. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

Real "PULL"

...3,000,000 Lbs. Worth

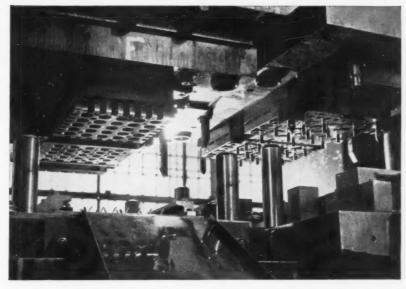




PRODUCES INTRICATE FLOOR-PLATE SECTION



The picture at the upper right shows the business end of a large blanking-and-forming die, used in making floor-plate sections for Flash-Stone Company, Inc., Philadelphia. The photograph below shows 11-gage sheet steel being fed into an 850-ton press, beyond operator, where it undergoes initial blanking and forming. Additional forming, plus trimming, are done in a return pass, at operator's left. Above appears the



finished product, an 11¾-in. square, with numerous lugs on the top and sides for gripping the concrete.

The die, made of Lehigh H tool steel, is providing long production runs because of its good resistance to wear and shock. Redressing is seldom required.

Lehigh H is a high-earbon, highchromium, air-hardening tool steel, well known for its easy machinability and easy heat-treatment. It's a deephardening steel, too, with high compressive strength,

TYPICAL ANALYSIS

Carbon 1.55 Molybdenum 0.80 Chromium 11.50 Vanadium 0.40

Like to prove to yourself how Lehigh H Tool Steel wears... and wears? Call your tool steel distributor, or write a line direct to us at Bethlehem, Pa.



Sheet steel, being fed into press for initial blanking and forming, is further formed and trimmed on the return pass into the finished floor plate, which is shown on the slide near foot of picture.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

Use Distortion Tests With Care

Distortion of tool steel in heat-treatment is a phase of toolmaking which is often misunderstood. And some of the available distortion-test data adds to the confusion.

Typical of the misleading distortion tests are those on bar stock, about 3/4 in. round and 1 in. long. The results are reported as the change in length occurring in the hardening heat-treatment, and certainly do tell what happens when steel of that size is hardened. But how to use this data to predict size changes of tools of other sizes? There's the rub!

The test described implies that the distortion figure for the 1-in. piece can be applied elsewhere—for ex-

ample, that a 5-in. piece changes 5 times as much, and a 10-in. piece 10 times as much. Not so! Depending on the size and shape of the pieces being hardened, expansion or contraction may occur, but the factor cannot be used to predict which. Therefore the data obtained on the test piece is of limited value, as it applies only to the hardening of tools of the size and shape of the test piece itself. There is no such thing as a single test specimen which predicts size changes in tools of various sizes and shapes.

If you would like additional information on distortion, write for a copy of our article, "Distortion of Tool Steels in Heat-Treatment."

More Life Between Grinds With... HAYNES STELLITE Tools

2,000 CYLINDER WALLS PER GRIND

The HAYNES STELLITE tools used in this multiple boring head last from 4 to 6 weeks between grinds. The part is a cast iron compressor housing. Machining was complicated by mold sand inclusions and intermittent cuts due to irregular contours and variations in chill depth. Spindle speed is about 45 r.p.m., and machining is done dry.



The 20 Haynes Stellite tools used in this boring head (described above) are usually good for 25 grinds.



◆ TOOL LIFE INCREASED FROM 6 TO 12 TIMES

The longer life of Haynes Stellite tools saved this plant from 1 to 2 hours each day in grinding time alone. The parts being machined are chromium-molybdenum shafts with a hardness value of 269 Brinell. Haynes Stellite tools averaged 80 shafts every 3 hours before they had to be ground. Tools previously used had to be ground every half hour or less, producing as few as 5 shafts per grind.



For further information about Haynes Stellite tools, and how they may be useful to you, write for the booklet entitled, "Haynes Stellite Metal-Cutting Tools." This practical manual of cutting tool practice is published as a service to you.



HAYNES STELLITE

Trade-Mark

Metal Cutting Tools

The original cobalt-chromium-tungsten metal-cutting tool.
"Haynes Stellite" is a registered trade-mark of Union Carbide and Carbon Corporation.

Haynes Stellite Company

A Division of Union Carbide and Carbon Corporation

General Offices and Works, Kokomo, Indiana Sales Offices

Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

eliminate the

guesswork

in selecting tool steels

Thousands of metal working people are using the Crucible Tool Steel Selector to determine exactly which type of steel they need. This handy selector covers 22 tool steels which fit 98% of all tool steel applications.

The selector is unique because it starts with the ultimate use of the steel. It breaks down all tool steel applications into six major classifications, under which the different grades of steel available for certain specific requirements are indicated in legible cutouts. Heat treatment and machinability data are also included for each grade.

A flip of the dial will give you the answer, and almost just as quickly you can get the steel you select. For each type of steel shown on the selector is in stock in Crucible warehouses, conveniently located throughout the country.

To get your Selector merely fill in the coupon and mail. There is no obligation whatsoever.



1/3 actual size, Selector is in 3 colors

HERE'S AN EXAMPLE:

Application - Deep drawing die

Major Class - Metal Forming -

Sub-Group - Special Purpose

Tool Characteristics - Wear Re-

Tool Steel - Airdi 150

A turn of the dial does it! And you're sure you're right

Crucipie Steel Co	ompany of Americ	a
Dept. M, Oliver	Building	
Pittsburgh 22, F	a.	
Name		
		Title
Company		

CRUCIBLE first name in special purpose steels

TOOL STEELS

54 years of Fine steelmaking

CRUCIBLE STEEL COMPANY OF AMERICA . TOOL STEEL SALES . SYRACUSE, N. Y.



Here's Why

controls and attachment of the base assembly to the body unit. Furthermore, the Cory name and address and other nameplate data for the percolator are engraved on the bottom of the base in the

automatic electric coffee percolator, the engineers of the Cory Corporation spared nothing in their effort to make this product the finest in its field. And the dual objective of maximum beauty and utility was achieved, in large measure, through the use of six ZINC Die Cast components. Of these, the above base casting is the most outstanding.

In designing the beautiful new "Crown Jewel"

The "Crown Jewel" is just one of a great many new products made more salable through the use of ZINC Die Castings. For additional examples

die casting operation.

This ZINC Die Casting is shown as it is received by Cory from the die caster. The stepped exterior design is clean-cut-with recesses for the legsand a minimum of preparation is required to coat the as-cast surfaces with a handsome and durable 24-karat gold plate. The interior of this sturdy ZINC Die Casting has a cored center hole and cast bosses and splines which facilitate assembly of the thermostat

ask us-or any die casting companyfor a copy of "The End Uses of Zinc Die Castings."

which are claimed to insure retention of the flavor-bearing coffee oils. Its body, spout and cover are gleaming stainless steel, its raffia style handle is heat-proof

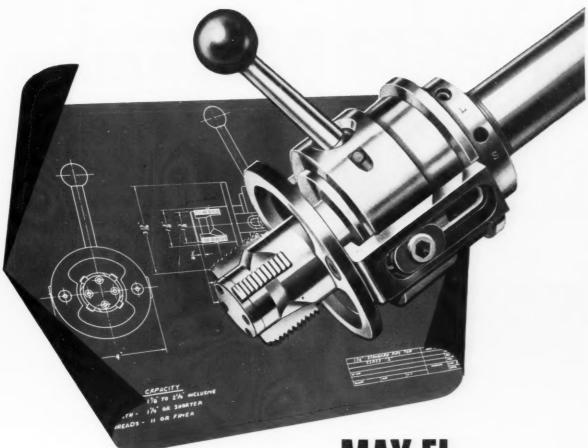
plastic, and its base, legs and handle holders are ZINC Die Cast.



160 Front St., New York 38, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on

99.99 + % HORSE HEAD SPECIAL Uniform Quality

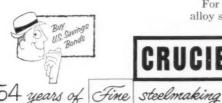


Universal collapsing tap parts of MAX-EL alloy steel finish machined after full heat treatment

Considerable machining is required in the manufacture of parts for these taps. That's why Crucible MAX-EL® 31/2 free machining alloy steel was chosen by the Geometric Tool Company, Division of Greenfield Tap and Die Corporation. For with MAX-EL you can rough machine, then heat treat even intricate parts before final machining with no danger of distortion of the steel.

But the best way to check the advantages of MAX-EL is to try it in your own shop. Like many other users you'll appreciate its superior machinability, freedom from distortion, deep hardenability characteristics, uniformity and quality. And you'll like the longer tool life you get by using MAX-EL.

For complete data . . . and quick delivery of MAX-EL alloy steels call Crucible.



CRUCIBLE first name in special purpose steels

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DAYTON
DENVER • DETROIT • HOUSTON • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH
PROVIDENCE • ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • ST. PAUL • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C. Canadian Distributor - Railway & Power Engineering Corp., Ltd.

Get more parts per hour

Look how MX has increased production and increased tool life on these typical screw machine parts

stock	machine	operations	comparative performance				
part size			grade	SFM	seconds per part	production increase	tool life increase
5/8" round	turn break dov	rough form turn	B-1113	285	3.17		
DRUM NUT		tap finish form	MX	345	2.86	11%	87%
1/4 "	Brown &	rough form	B-1113	255	7.0		
round	Sharpe # 00	finish form ream turn					
		cut on	MX	277	4.5	55.6%	30%
³⁄4 " round	Brown & Sharpe	drill ream cut off	B-1113	172	14.2		***
			MX	250	10.0	42.5%	100%
13/8 " round Sha	Brown & Sharpe G-2	arpe recess, drill	B-1113	245	35		
		form face cut off	MX	312	27.5	27%	25%
	5/8 " round 1/4 " round 3/4 " round	5%" Acme round Gridley 14" Brown & Sharpe # 00 34" round Sharpe	Size Machine Operations	Size Machine Sperations Grade	Stock size machine operations grade SFM	stock size machine operations %" round Acme Gridley drill rough form turn break down tap finish form cut off B-1113 285 3.17 ¼" round Brown & Sharpe # 00 rough form finish form ream turn cut off B-1113 255 7.0 ¾" round Brown & Sharpe # 00 drill ream cut off B-1113 172 14.2 ¾" round Brown & Sharpe G-2 drill recess, drill tap thread form face B-1113 245 35	Stock size machine operations grade SFM seconds per part production increase

and longer tool life ... do the job with MX

the freer-machining screw stock available in both Bessemer and Open Hearth

Make a note of this: USS Free-Machining MX Steels have been successfully machined at speeds approaching 350 SFM.

A broad appraisal of all screw machine operations shows that the *average* speeds used are under 250 SFM and that only a small percentage of parts are machined at speeds in excess of 300 SFM.

So unless you are operating at the highest speeds—and comparatively few shops are—you simply don't need and can't take advantage of any greater machinability than MX offers.

Remember that USS Free-Machining MX is designed to ensure maximum cutting speeds compatible with economical tool life. And it does. Wherever fast-cutting MX is put to work, production goes up and costs come down. From results obtained in shops that have used MX in more than a billion parts of many different kinds, we feel sure that MX will cut the cost of any part you now machine from ordinary screw stock. It does this in four ways.

By increasing the rate of production, MX lowers the cost per part. By prolonging tool life, MX reduces down time. By assuring better part finish, MX often eliminates extra finishing operations. By providing closer dimensional accuracy, MX helps to minimize rejections. In short, USS Free-Machining MX offers you greater economy and greater efficiency in your machining operations.

In view of these facts we suggest that you carefully review your screw machine operations. If you normally operate at speeds lower than 350 SFM, your best bet is USS MX, either Bessemer or Open Hearth. You'll be money ahead—get more parts per hour, longer tool life and better parts—if you use MX, which you can buy at the *same* price you pay for comparable grades.

USS Free-Machining MX is produced in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier either as "MX" or under his own identifying trade name. In hot-rolled form MX is available through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH - AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO - TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



another NEW product from the labs of Oakite

OAKITE RUSTRIPPER

for ALKALINE de-rusting of precision parts

Another new Oakite material for you – Oakite RUSTRIPPER. It's specially designed for alkaline de-rusting of precision parts where dimensional change and acid embrittlement must be avoided.

In addition to removing rust and heat scale from ferrous metals, Oakite RUSTRIPPER proves effective in some cases, for descaling heat-treated titanium.

Oakite RUSTRIPPER is a heavy-duty powder type compound that may be used hot or cold. It may also be used with direct current to remove deep-pitted rust or with reverse current to remove heat scale.

Oakite RUSTRIPPER does not contain cyanide and may be disposed of in the same manner as any highly alkaline solution. Cyanide, however, may be added should the need arise.

If you would like to know more about Oakite RUSTRIPPER or would like a demonstration without obligation write Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

Check these BIG advantages

Oakite RUSTRIPPER
will not attack sound metal

Oakite RUSTRIPPER
will not cause hydrogen embrittlement

Oakite RUSTRIPPER
needs no special stainless steel equipment

Oakite RUSTRIPPER gives off no troublesome fumes

Oakite RUSTRIPPER
strips some paints as it de-rusts

Oakite RUSTRIPPER
protects against re-rusting



OAKITE PRODUCTS, INC., 26 RECTOR ST., NEW YORK 6, N. Y. Technical Service Representatives in Principal Cities of U.S. & Canada



Shelby and Sweeney tame a tough nut

• The Sweeney Powerench is a rugged nut turning tool specifically designed with geared action for tightening or loosening the nuts on dual wheels, aircraft propeller shafts, diesel engine cylinder heads, railroad locomotives, and for countless other heavy-duty applications.

Super tough equipment calls for super strong materials. That's why Shelby Seamless Mechanical Tubing—in sizes from $1\frac{1}{8}$ in. O.D. to $5\frac{5}{8}$ in. O.D.—is used in the manufacture of Powerench assemblies. The great strength, complete uniformity, and extreme dimensional accuracy of Shelby Seamless make it the ideal mechanical tubing for the fabrication of such heavy-duty materials. Moreover, it is safe and workable—possessing excellent machining and superior welding properties.

Produced to exacting standards by the world's largest manufacturer of tubular steel products, Shelby Seamless Mechanical Tubing is available in a wide range of diameters, wall thicknesses, various shapes and steel analyses. Call on our engineers for recommendations. They will be glad to make a study of your particular requirements and help you apply Shelby Seamless to your specifications.

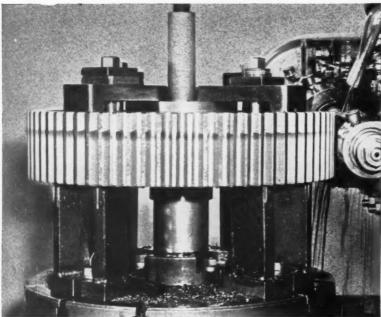
NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialies)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS

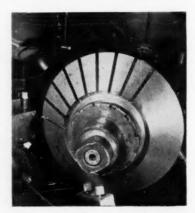


USS SHELBY SEAMLESS MECHANICAL TUBING US





Machining an axle gear at the plant of Goodman Manufacturing Co., Chicago. Widely known for its mining equipment, Goodman is a regular user of Bethlehem gear blanks.



Many firms make strong bevel and miter gears from Bethlehem blanks.

How to make a STRONG Gear and still keep its weight down

Often the first problem in gear design is to achieve high strength with a minimum of weight. Bethlehem supplies an answer to this common problem with its forged-and-rolled gear blanks, which are available in sizes from 10 to 42 in. OD.

Forged-and-rolled means just what it says. The blanks are processed in a unique mill that combines the steps of forging and rolling, with the attendant benefits of both. Each blank has the density and compact internal structure of forged metal, plus the smooth grain flow of a rolled product. The end result is strength—high load-bearing strength. Thus users frequently find it possible to employ thinner, lighter sections than they formerly specified, and still meet every requirement.

Also, because of their good grain flow, uniform density, and clean, homogeneous metal, the blanks are very easy to machine. Cutting speeds are frequently higher, and finish-machining can often be accomplished with fewer cuts.

If you manufacture spur, bevel, miter, herringbone, or other types of gears, Bethlehem's forged-and-rolled blanks can lead to important economies. Please remember, too, that they are excellent for sheave wheels, industrial wheels, turbine rotors, clutch drums, tire molds, and numerous other circular steel products.

Many details—and almost 100 pictures—are to be found in Booklet 216, which is yours for the asking. Write today for a free copy, addressing request to Bethlehem Steel Company, Publications Dept., Room 1037-A.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation Export Distributor: Bethlehem Steel Export Corporation



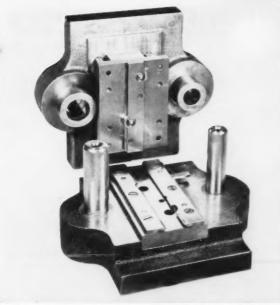
Goodman shop craftsman tests a finished gear with master pinion.



BETHLEHEM

Forged-and-Rolled

CIRCULAR FORGINGS



Simple progressive washer die, used at Precision Spring Company, Detroit, Michigan, pierces and blanks springtempered steel washers. With millions of accurate hits per sharpening, this die builds profits by cutting costs.



Complex lamination die punches two high-silicon "L" laminations per stroke. Dies of this type are in use throughout the metal-working industry, outwearing and outproducing steel dies by up to fifty times.

Dies equipped with CARBOLOY. increase production from 10 to 50 times

Over a wide range of applications, Carboloy cemented carbides have proved their superiority to steel by increasing production and cutting costs.

Here are some of the actual results achieved when users of large and small, simple and complex dies, switched from steel dies to dies equipped with Carboloy cemented carbide:

Lamination die. With Carboloy cemented carbide, production runs averaged 35 times longer than possible with steel.

Pierce and cutoff die. At 400 strokes per minute, carbide - equipped dies produced 2,000,000 strokes without resharpening.

Blanking and drawing die. Carbideequipped die lasted months before resharpening. Steel required maintenance every week.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company **Deep drawing die.** With Carboloy cemented carbide, manufacturing time per 100,000 pieces was slashed from 70 hours to 52 hours.

Explore the possibilities of using Carboloy cemented carbides in your dies. Carboloy engineers will give you or your die-maker every possible assistance. And, you can have your key men trained at the Carboloy Die School in Detroit.

Carbides are simple to use, easy to maintain. They'll pay for themselves through increased production, fewer rejects, reduced downtime and higher quality.

For complete information or for free Carboloy Die Engineering Manual, send coupon, today.

CARBOLOY

Department of General Electric Company 11147 E. 8 Mile Road, Detroit 32, Michigan

- Rush me free Carboloy Die Engineering Manual D-124.
- ☐ Send complete details on free Carbolay Die Training School.
 ☐ Have a representative of the Carbolay Engineering Appraisal Service call at my plant, at no obligation to me.

Name_____Title_

Company

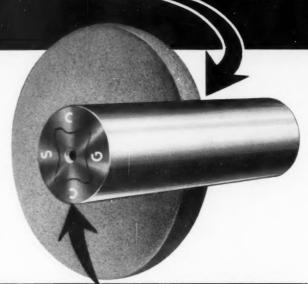
ddress

An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight, smooth & really accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is carefully tested before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845

INCORPORATED 1892

122-Machinery, November, 1954

For more information on products advertised, use Inquiry Card, page 265

WHY IT PAYS TO BUY MECHANICAL TUBING FROM US



• There's no need of sacrificing large areas of valuable floor space for tubing storage when those areas *could* easily be made productive. Why not let *us* carry the storage and handling costs?

Our warehouses stock an exceptionally large variety of tubing products . . . in fact, no less than 531 sizes of Shelby Seamless Mechanical Tubing are readily available! So you can always count on quick delivery of exactly the type and size tubing you need . . . whether your order is by the inch or by the carload. And all our tubing products are made by the world's lead-

ing manufacturer of fine tubing and pipe —National Tube Division of U. S. Steel.

And, our extensive experience with tubing problems has often led to customer savings. For in many cases, our engineers can suggest a more economical type of tubing for your application.

Contact our nearest warehouse the next time you need quality tubing of any sort and in any quantity from our stock or directly from the mill: mechanical tubing, round and square, seamless and welded; boiler tubing, pressure tubing and pipe; and stainless steel tubing and pipe, seamless and welded.

TRIPLE

What you want When you want it At the right price

U.S. STEEL SUPPLY

DIVISION

General Offices

208 So. La Salle St., Chicago 4, Ill.



Warehouses and Sales Offices
Coast to Coast



UNITED STATES STEEL

2 Stainless Parts...look alike





Problem of 80% rejects is solved

This is a precision part for a military bombsight. Some of the tolerances are ±.0001". Dependability is a "must". Every factor has to be "on the nose". Yet when the subcontractor used several ordinary Type 416 Stainless steels, rejects ran as high as 80%. But then he made one change...to Carpenter No. 5 (Type 416) ... and eliminated the problem.

Tool life increases

Also, tool life was short, machine downtime excessive, and production was lagging. Then one change was made-to Carpenter Stainless No. 5-and machining time was shortened, tool life raised to a troublefree level.

Production jumps

With Carpenter No. 5 production of this part is up to schedule because the reject problem has disappeared, machining time stepped up and tool life increased. Here is just one more example of how Carpenter quality makes a real difference in stainless fabrication. The next time you order stainless, be sure it's Carpenter. Watch it speed productionease headaches from first operation to the last.





Make the one change that counts...

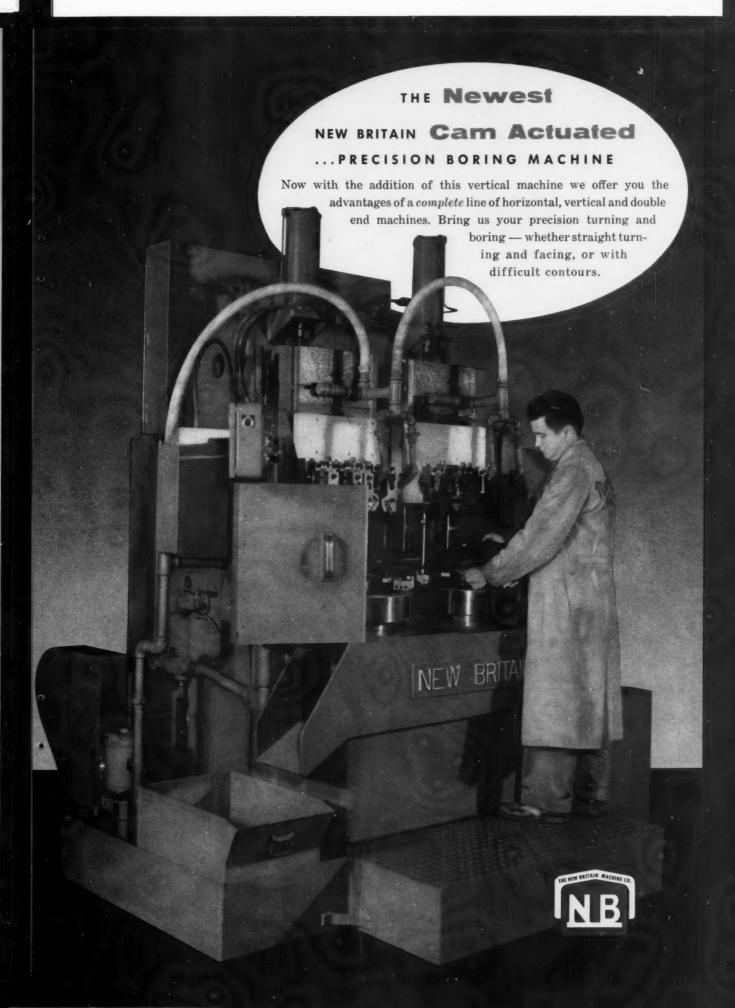
change to arpenter

Free-Machining Stainless

take the problems out of production

THE CARPENTER STEEL COMPANY, 105 W. Bern St., Reading, Pa. Export Department: The Carpenter Steel Co., Port Washington, N.Y.-"CARSTEELCO"

For fast delivery, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor



New New Britain

A SINGLE SPINDLE AUTOMATIC BAR MACHINE

The same rugged dependability you like in your New Britain multiple spindle automatics can now be found in the Model 126 single spindle automatic. It gets on the job quicker and easier because of new quick set up and operating features . . . and like all New Britains it stays on the job.

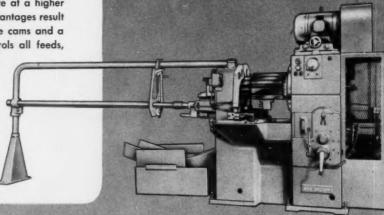


NEW BRITAIN CAM-CONTROLLED PRECI-SION BORING AND TURNING MACHINES reproduce size and finish with absolute certainty, piece after piece, hour after hour, day after day. The model illustrated generates all types of radii, chamfers, undercuts, grooves, faces, etc.; plus straight boring and turning. This simple, accurate high speed machine reduces manufacturing costs on a wide variety of sizes and types of piece.

NEW BRITAIN DOUBLE END TOOL OR WORK ROTATING PRECISION EORING MACHINE specifically designed for products requiring the most exacting accuracy at high production rates. Tooling set ups and types of pieces machined are practically unlimited. Both double end and single end jobs can be profitably produced on this machine by the use of its automatic cycling features.

NEW BRITAIN MODEL 126 SINGLE SPIN-DLE AUTOMATIC was designed specifically to reduce "down time" and operate at a higher percentage of efficiency. These advantages result from pre-set wedge-type cross slide cams and a central program drum which controls all feeds,

speeds and sequences. Inherent simplicity and adaptability make it ideal for both long and short runs.



EW BRITAIN



Our general catalog is filed in the Sweet's Machine Tool Catalog File.

AUTOMATIC BAR and CHUCKING MACHINES . PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES
NEW BRITAIN +8F+ COPYING LATHES

The NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

II MODELS

3 SCREEN SIZES



Pedestal Type 14" Diam. Screen



Bench Type 14" Diam. Screen 4 Models



Bench Type 5%" x 7%" Screen 3 Models

Unsurpassed Inspection Versatility JONES & LAMSON OPTICAL COMPARATORS The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- They meet the requirements of toolroom, laboratory and production inspection.
- They precisely measure height, depth, lead or spacing, as well as angles to degrees and minutes.
 They will measure to .0001".
- They compare intricately contoured parts with a master outline—and measure the amount of error.
- They are convenient to operate, easy to set up and read direct-without computation.
- They operate under normal lighting conditions. No darkroom is needed.
- They will photograph the enlarged shadow and record its relationship to a master chart.
- Several persons may study the shadow at the same time.
- They will inspect and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.



Vertical Type 14" Diam. Screen



Direct Projection Type



Pedestal Type 30" Diam. Screen

 $P_{\mathcal{S}} \longrightarrow$

A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY 512 Clinton St., Springfield, Vt., U.S.A.



Machine Tool Craftsmen Since 1835

COMPARATOR DIV.



Jones & Lamson Machine Company 512 Clinton Street, Dept. 710 Springfield, Vermont, U. S. A. Please send Comparator Catalog No. 402.

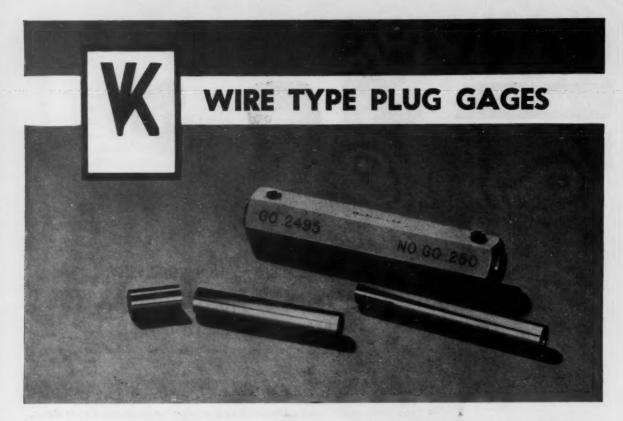
NAME_____TITLE___

COMPANY

CITY_____STATE___

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-125



VASTLY LONGER-LIVED and MONEY-SAVERS

because they're "Cut-off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able". And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/8" may be cut off when ends become worn and as many as from five to ten gages made available from the 1.7/8" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible fea-

VK Wire Type Gages are available in ZZ to

XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog and Handbook No. 35, available on request by writing to: The Van Keuren Co., 178 Waltham Street, Watertown, Mass.



THE Van Keuren co.

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires Chrome Carbide Taper Insert Plug Gages



A BETTER COUPLING

here's the BIG DIFFERENCE

During recent years there has been a demand from the Aircraft Industry for a more flexible, stronger Gear Coupling. Although Philadelphia "Sphereflex" Coupling was developed in answer to this special need, it is now being offered to Industry in a complete line of standard, vertical and floating shaft couplings.

The "Sphereflex" Coupling utilizes a revolutionary new principle of coupling design, in that the gear teeth are precision cut on a true spherical arc. Since even the root of the gear tooth is curved, there can be no interference between mating gear teeth, even when shaft deflections range up to 7" total mis-alignment. The "Sphereflex" Coupling is in radical contrast to former methods of obtaining flexibility through excessive backlash or merely chamfering the tips of the gear teeth.

"Sphereflex" is a stronger coupling, because there is always a full line of contact between mating-gear teeth, regardless of whether the coupling is flexed or perfectly aligned.

Size for size, the new "Sphereflex" Coupling will withstand more deflection, greater torque, higher rotating speeds, and more severe shockloading than comparable couplings.

And remember, you pay no more for a "Sphereflex" Coupling than other good quality couplings.

Write for Catalog C-540.

PHILADELPHIA GEAR WORKS, INC.

This shows how the gear teeth are cut on a true spherical arc.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK PITTSBURGH CHICAGO HOUSTON LYNCHBURG.



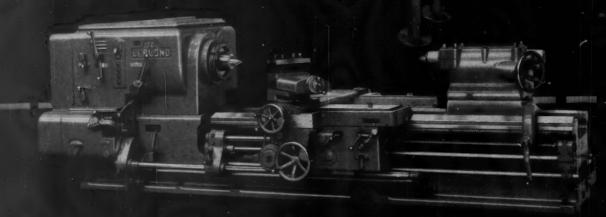
Industrial Gears & Speed Reducers

LimiTorque Valve Controls

LeBlond sliding



16"/32"



32"/50"

bed gap lathes

4 Sizes, 16"/32", 25"/50", 32"/60" Heavy Duty & 17"/28" Regal

The most versatile lathes in the world give you:

Occasional work with large of

Variable gaps for work with large projections

Occasional work with large or irregular projections doesn't warrant buying a large-swing lathe. And extra-long pieces that have to be turned now and then don't justify the cost of a long-bed machine. That's why tool rooms, maintenance departments and contract shops depend on LeBlond Sliding Bed Gap Lathes for both out-sized jobs and everyday engine lathe work.

Here's how they work. LeBlond Sliding Bed Gap Lathes are built with two bed sections. The top bed is movable on the lower. With the top bed extended, a wide gap is created providing nearly twice the swing of a conventional engine lathe. Center distance can also be increased greatly allowing long lengths to be turned. With the gap closed this triple-duty lathe does all the work of a heavy-duty engine lathe of comparable size.

LeBlond Sliding Bed Gap Lathes come in four sizes. Three heavy-duties, the 16"/32", 25"/50" and 32"/60"; and a low-cost 17"/28" Regal. These lathes will give you swings up to 61½" and up to 13' distance between centers (base).

And, of course, you get all the well-known LeBlond features. Hardened and ground steel bed ways; low-friction, high-power Spur Gear headstock; totally enclosed quick-change box; automatic lubrication; one-piece apron; thrust-lock tail-stock, and many more.

Where utmost versatility is what you need in a lathe, you can't do better than a LeBlond Sliding Bed Gap. Whatever your turning needs may be, one of LeBlond's 76 models is bound to suit. Contact your nearby LeBlond Distributor or write Cincinnati today.

--- Adjustable center distance for extra-long work

For complete description and specifications of the 16" |32", 25" |50" and 32" |60" heavy duties ask for Bulletin SBG-103D. 17" |28" Regal, Bulletin RSBG1D

Capacity for all regular engine lathe work

.... turned faster by



THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES . FOR MORE THAN 67 YEARS.

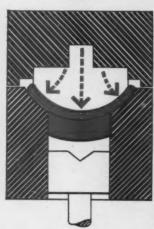
For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-129

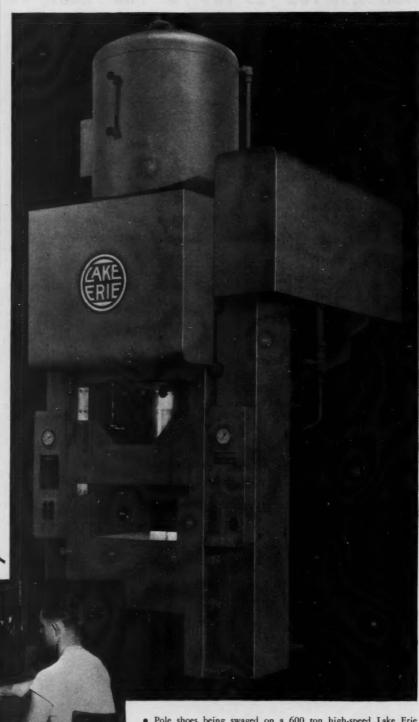
COLD-FORMING

ANOTHERexample of the BIG TREND in metalworking





"MOVE the metal ...it's cheaper than REMOVING it!"



• Pole shoes being swaged on a 600 ton high-speed Lake Erie Hydraulic Press. Production of these pieces averages 2,000 per hour.

PAYS OFF 4 WAYS!

A major producer of automotive parts and electrical systems reports:

MATERIAL SAVINGS
of 50% or more common in pro-

2 LOWER TOOLING COSTS
because special-purpose
machines are eliminated.

3. DELAYS AVOIDED in starting production.

4 HIGH PRODUCTION RATES are realized with cold-forming processes (sizing, swaging, coining and extruding).

The big trend in metalworking today is to press metal into a desired shape rather than to shape it by machining. This results in new and better products at lower cost. These new processes include cold "pressure" forging of aluminum, cold extrusion of steel, and high pressure closed die extruding of aluminum, brass and other non-ferrous alloys. Also falling within this category are somewhat older though greatly changed and improved methods for the extrusion of aluminum, hot forging of ferrous metals, powder metallurgy, deep drawing of sheet and die casting. These new and improved production techniques are already saving millions of dollars in materials and production time. Lake Erie engineers are in the forefront of these developments. They will be glad to explore applications in your production. No obligation. Call us.





LAKE ERIE ENGINEERING CORP.

General Offices and Plant:

470 WOODWARD AVENUE, BUFFALO 17, N.Y. District Offices: New York, Chicago, Detroit, Pittsburgh Representatives in Other U.S. Cities and Foreign Countries

HYDRAULIC PRESSES • DIE CASTING MACHINES ROLLING MILL AUXILIARY EQUIPMENT

LAKE ERIE®



In Plastics



In aluminum



In Cast Inon



In Wood



In Steel

NATCO
MULTI-DRILLERS
and TAPPERS



H-5 and H-6

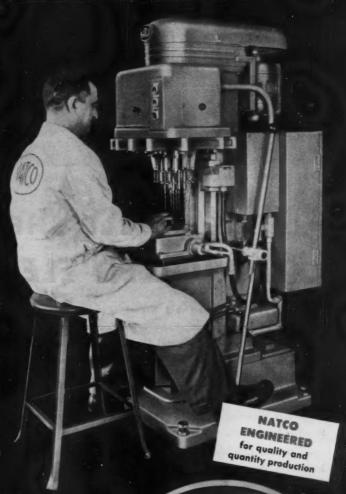
MACHINES
(H-6 Machine Illustrated)

...REDUCE COSTS WITH INCREASED PRODUCTION OF SMALL PARTS!

The NATCO Model B-33 light, sensitive multi-drilling and tapping machine shown at right is available in three feed arrangements: hand and foot feed or combination hand and foot and air-oil feed; and air feed. These machines have adjustable spindle arrangement for different work setups and a large working table. They offer maximum production on light work where super-sensitive operations and high speed are important.

NATCO H-5 and H-6 high speed sensitive multi-drillers and tappers are furnished in standard and heavyduty models with adjustable multispindle, fixed center spindle or slip spindle type heads. They are provided with change gears and quick change speed mechanism for correct spindle speeds. They will efficiently handle a wide range of small and mediumsized work and make possible multiple drilling or tapping of small holes at minimum cost.

B-33
LIGHT, SENSITIVE
MACHINE





Call a Natco Field Engineer

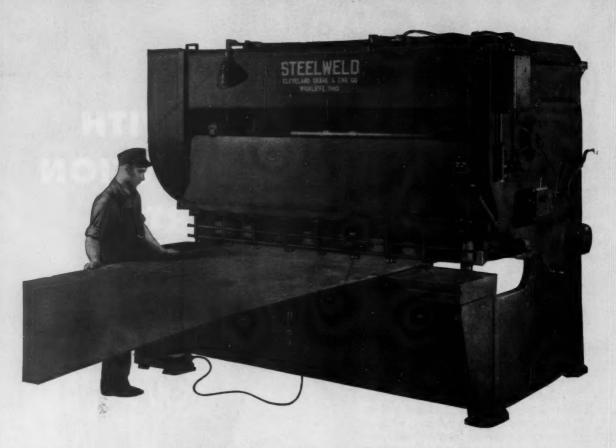
to help you solve your problems in Drilling, Boring, Facing and Tapping



NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

CHICAGO, Room 203, 6429 W. North Ave., Oak Park * DETROIT, 10138 W. McNichols Rd. BUFFALO, 1807 Elmwood Ave. * NEW YORK, 35 Beechwood Ave., Mount Vernon



ALL STEELWELD SHEARS CONTROLLED ELECTRICALLY...

OPERATION of Steelweld Shears is unusually easy and convenient. There is no tiresome lifting of the leg to work a foot treadle. Slow, fatiguing knee action has been replaced by fast easy toe action.

A safety type electric foot switch is used. It can be slid around the floor wherever most convenient. It enables shearing speeds not attainable with foot treadles for certain cutting operations.

For instance, when cutting narrow strips from a long sheet, the operator can push the sheet at the end and control the shear at the same time. He need not be near the machine. As the sheet becomes shorter he can move the switch along with his foot to always be within easy reach.

There is no extra charge for electrical foot control on Steelweld Shears — it is standard equipment on all size machines.

Steelweld Shears are radically different from all other shears with many outstanding features. Get the facts on these truly new and modern machines. Learn about the advantages they offer you.



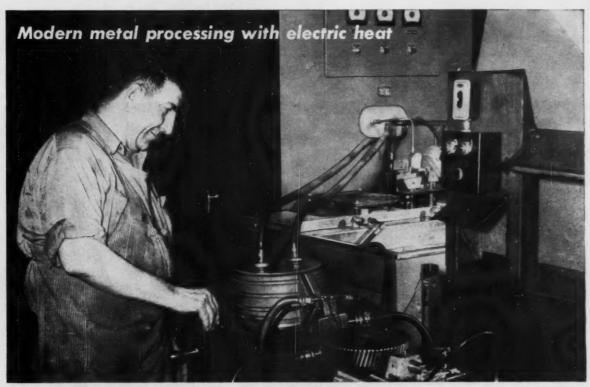
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Professiv illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5403 EAST 282ND STREET, WICKLIFFE, OHIO

STEELWELD PINOTED SHEARS



TOOTH-AT-A-TIME HARDENING USING G-E INDUCTION HEATER PRODUCES HIGH-QUALITY GEARS IN MANY SIZES.

Fifteen-inch gears quality hardened with 20-kw G-E induction heater

New Britain Machine eliminates grinding and copper plating costs

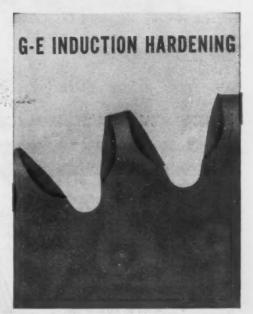
By switching from furnace to induction hardening with General Electric induction heaters, New Britain Machine Co., New Britain, Conn., improved their gears with a minimum investment in new equipment.

Equipment costs were reduced by installing a fixture that makes it possible to harden a tooth at a time. In this way, New Britain can heat-treat gears up to 15 inches in diameter with only a 20-kw G-E heater.

Hardening is confined to the tooth surfaces, where the wear is greatest, leaving the core shock resistant. Formerly, New Britain either carburized and hardened the gears completely—a process which caused distortion and required expensive grinding—or they had to copper plate the gears for selective hardening.

For information on how you can cut costs and improve your products using G-E induction heat, contact your nearest G-E Apparatus Sales Office. And write for the new modern-metal-processing bulletins—Forging with Induction Heat, GEA-5983, and Furnace and Induction Brazing, GEA-5889. Address: Section 720-137, General Electric Co., Schenectady 5, N. Y.





WITH ACCURATE INDUCTION HEAT, hardening can be limited to areas where pressure and wear are greatest. Core remains shock resistant.

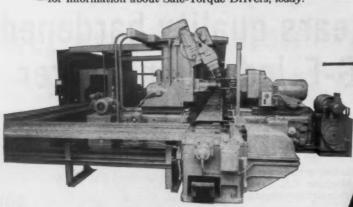
New Driver prevents tap

Scully-Jones Safe-Torque Driver rapidly being adopted to cut tapping costs!

Savings like these are why Scully-Jones Safe-Torque Drivers are being adopted so rapidly by machine tool builders and users. On the job illustrated, breakage has been virtually eliminated. On a radial drill, only two taps were broken tapping 500,000 holes—former average was a broken tap for every 200 holes tapped.

This remarkable record is the result of two advance-design features. (1) A spring-loaded centering plug absorbs shocks when bottoming in blind holes. The cushioned stop and instantaneous release of the drive permit bottom-tapping at full speed to full depth without breakage. (2) The overrunning roller drive releases completely when the tapping torque reaches a preset danger point. There's no intermittent overriding motion (impact action and vibration)... no slipping friction surfaces (overheating) to cause wear, poor control over torque settings, and inaccurate work. You get uniform, accurate threads. And adverse tapping conditions, such as hard spots, poor chip removal, inadequate cooling or lubrication, and improper sharpening of taps, are brought under new, more effective control.

Call your Scully-Jones representative or distributor—factory trained "Precision Tool and Work Holding Specialist"—for information about Safe-Torque Drivers, today!



Transfer machine, built by Buhr Machine Tool Co., Ann Arbor, Michigan, is factory-equipped with special Scully-Jones Sufe-Torque Drivers for safe tapping in automobile clutch housings.

THERE'S A SCULLY-JONES PRECISION TOOL FOR

Drill Chucks

—for driving straight shank
tools. Permit use of jobberlength drills, saving extra cost
of taper shank drills.

Tap Chucks
—save costly setup time. Eliminate bell-mouthed and oversized tapped holes. True collet action on shank of tap.

EVERY HOLDING OR DRIVING NEED

Close-Center Tap Drivers
—for tapping holes close together or near shoulder of work.
Collet action minimizes strain
and saves taps.

Quick-Lock Adapters
—permit accurate depth adjustments in cluster of spindles. Stop
guesswork on fine adjustments.
Speed tool changes.

breakage on Buhr Specials



SCULLY

Scully-Jones and Company, 1906 South Rockwell St., Chicago 8, Illinois

WRITE FOR NEW **BULLETIN 20-50**

Gives you important features, specifications, and field test reports on Safe-Torque Drivers.



Gentlemen: I'm interested in learning more about Scully-Jones Safe-Torque Tap Drivers . .

- Please send Bulletin 20-50.
- Have representative call.

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-137

Let DAVIS cut your Boring Costs 2 ways

WITH Standard Tooling ITEMS FROM INDUSTRY'S MOST COMPLETE LINE

IN STANDARD BORING HEADS ALONE DAVIS PRODUCES AND CATA-LOGS OVER 133 DIF-FERENT SIZES AND TYPES. Every boring job in your shop...regardless of range, material or complexity...can be done fuster, cheaper and with greater precision, when you make Davis your tooling headquarters. That's because only Davis has both the complete line and broad machining experience to supply or design exactly the right tool for your work.

Davis tooling specialists help you immeasurably in selecting the right tool from industry's broadest standard line. Their unrivalled background of practical shop experience assuros recommendations that exactly meet all your requirements for tolerances, finish, speeds, feeds and maximum tool life at minimum cost.

WITH Job-Engineered SPECIALS
FROM INDUSTRY'S FOREMOST DESIGNERS

Where work is beyond the scope of stundard tools or where efficiency can be improved or costs reduced by combined operations, special fixturing, etc., the specialists in Davis Engineered Tooling Service will work with you in developing tools for even the most complex application. Consult your local Davis field engineer or send us complete work details for impartial recommendations.

DAVIS
BORING TOOL DIVISION

Fond du Lac, Wisconsin

THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING



TYPICAL OF DAVIS SPECIAL TOOL DESIGNS IS THIS EX-TENSION BORING HEAD WHICH BORES, FACES AND GROOVES A 31" DIAMETER HOLE.



How to multiply production of straight bevel CONIFLEX® gears and pinions by as much as 500%

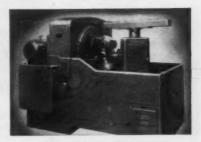
You can do it with the new No. 104 Straight Bevel CONIFLEX Generator.

The two interlocking disc-type cutters, with 24 blades each, complete a gear in one rapid operation.

This is the key to the remarkable performance of this new Gleason machine which achieves production rates up to 5 times as fast as any previous generator. In addition, a new generating method insures high efficiency, excellent finish, and maximum cutter life.

The range of capacity, and the ease of setup, make the No. 104 Straight Bevel Conflex Generator ideal for jobbing.

Calculations have been reduced to a minimum and can be done long hand or with slide rule.



The No. 104 Straight Bevel CONIFLEX Generator completes gears up to $8\frac{1}{2}$ " diameter and $1\frac{3}{8}$ " face width, and from 20 to 3 DP.

We will be glad to send a bulletin giving further details on request,

Straight bevel gears with localized tooth bearing.

GLEASON WORKS

Builders of bevel gear machinery for over 85 years 1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

OFF SHELF DELIVERY!

New compact design saves up to 10% space!

Proven

WITH EXTRA HIGH SAFETY FACTOR!

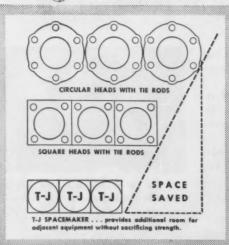
Spacemaker Spacemaker

OIL pressure to 750 - AIR to 200 P.S.I.

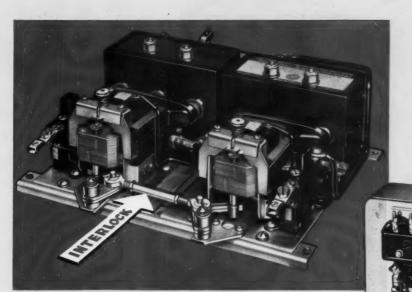
Now the sensational new T-J Spacemaker sets the pace in compact cylinder design and efficient performance!

New "Self-Aligning" adjustable oil cushion means faster acceleration and better cushion than ever before... New T-J Super Cushion Flexible Seals for air insure positive cushion with automatic valve action for fast return stroke.

More plus features include—heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, high-tensile, hard chrome plated piston rod. Write for bulletin SM-454-2. The Tomkins-Johnson Co., Jackson, Mich.



TOMKINS-JOHNSON
PIVITORS: AIR AND MYDRAULIC CYLINDERS. CUTYERS. CLINCHONS

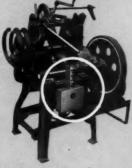


REVERSING ACROSS-THE-LINE STARTERS

The complete line of A-B solenoid reversing starters includes 8 sizes and 5 NEMA type enclosures.

Allen-Bradley reversing starters have two solenoid contactors—FORWARD and REVERSE—which are mechanically, as well as electrically, interlocked to provide maximum safety for motor and machine.

TYPICAL APPLICATIONS



Excelsior Circular Bending Machine with A-B reversing starter and 3-button control.



Baker Heavy Duty Drilling Machine with A-B reversing starter in NEMA 1 enclosure.

TROUBLE FREE REVERSING STARTERS

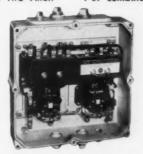
..... up to 300 HP, 220 V; 600 HP, 440-550V.

For squirrel-cage or slip-ring motors that must be reversed in their operation, the most dependable control is the Bulletin 705 reversing starter. The two Allen-

Bradley solenoid switches ... with their double break, silver alloy contacts ... are maintenance free. Their rugged construction makes them especially suitable for plugging operations. The contacts will not weld or flash over, and they require no cleaning, filing, or dressing.

Bulletin 706 combination reversing starters are equipped with manual disconnect switches, with or without fuses. Bulletin 707 combination reversing starters have

circuit breakers. Allen-Bradley reversing starters are available with or without overload relays. Listed as standard in enclosures for general purpose, watertight, weatherproof, and hazardous dust and fume locations. Write for A-B Handy Catalog, today.

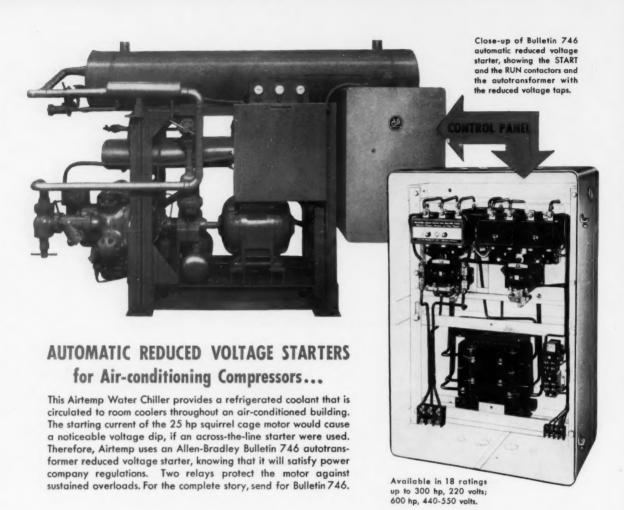


Bulletin 705 reversing starter in NEMA Type 4 waterproof enclosure.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Limited—Galt, Ont.

10-54-





QUALITY COMPONENTS OF ALLEN-BRADLEY BULLETIN 746 AUTOMATIC AUTOTRANSFORMER STARTERS

SOLENOID STARTER



The basic unit of the Bulletin 746 reduced voltage starter is the Bulletin 709 solenoid switch with double break, silver alloy contacts that are maintenance free. They are good for millions of trouble free "starts."

Right — Autotransformer with 50, 65, and 80% taps.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited
Galt, Ont.

TAPPED AUTOTRANSFORMER



Right - Bulletin 849 pneumatic adjustable timer which controls the time interval between closing of the"start"contactor and closing of the "run" contactor. It automatically disconnects the autotransformer and closes the running contactor for full voltage on the squirrel-cage motor



TIMING RELAY

10-54-R

ALLEN - BRADLEY

"Inside Story" on doubling production at the Minster Machine Co., Minster Ohio

This GRAY 6" PLANER TYPE BORING MILLING AND DRILLING MACHINE is really delivering "versatility with a punch."

Here's why:

- rotary table 84" x 96" permits quick, accurate positioning of multi-ton load.
- pendant central always within reach to provide
- automatic power clamps reduce manipulating time -insure uniform alignment conditions.
- gray non-metallic ways protect all precision guide
- 40 N. P. efficiently transmitted to the cutter



in half. Further savings are assured when they "open her up."

The G.A. GRAY Company

planers . milling planers planer type milling machines

CINCINNATI 7, ONIO, U. S. A.

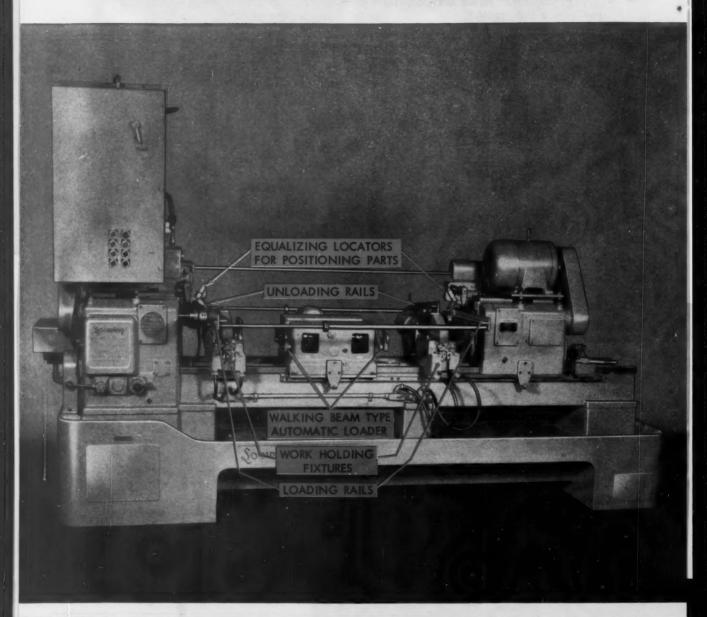
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. . SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-143

MACHINE OF

MODEL "CS" So-swing FACING AND CHAMFERING MACHINE HANDLES AND FINISHES BOTH ENDS OF TUBING AUTOMATICALLY



PRODUCTION COSTS

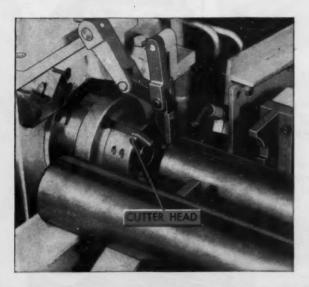
THE MONTH

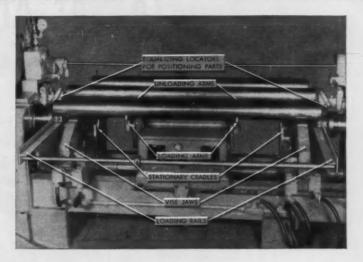
PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK

PROBLEM: To automatically load and unload Propeller Shaft Tubes, face to length and chamfer inside and outside diameters of both ends simultaneously.

selected for this job was equipped with a special Automatic Handling Mechanism and special vises, as shown on the opposite page. A close-up view of the working area of the machine with a rough tube clamped in the vise jaws and finished tubes leaving the machine on the conveyor rails at the rear is shown at the right.

The tubes arrive at the machine by conveyor and roll down to a fixed stop on the loading rails. At the end of the machine cycle, the cutter heads retract and the vises open, allowing the finished part to drop into a stationary cradle, which is positioned slightly lower than the center line of the vise jaws. An electrical contact then starts the work carrier motor imparting a rotating movement to the work





carrier arms which handle a rough and finished piece simultaneously.

The unloading arms remove the finished piece, depositing it on the conveyor rails leaving the machine, while the loader arms, in their trajectory, pick up a rough part and lower it into the stationary cradle for automatic positioning by the equalizing locators shown above. These locators assure removal of an equal amount of material from both ends of the tubes. The vise jaws close automatically as soon as the tube is correctly positioned. The machine starting clutch is then automatically engaged and the part faced to length and chamfered on both ends. Since the entire operation is automatic, no operator is required.

The illustration at the left is a close-up view of one of the machining heads, showing one of the equalizing locators in contact with the work. Part of one of the cutter heads, fitted with three tools for the facing and chamfering operation, can be seen in this view.

Seneca Falls engineers are at your disposal to assist in solving your AUTOMATION problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH So-swing

Some Simple Ways To Set An Angle

with Taft-Peirce Sine Checking Equipment

For Setting Up



T-P SIMPLE SINE ANGLE PLATE

is a convenient new device for setting up any angle from 0 to 90 degrees. A .1000" step on base provides for obtaining angles requiring a setting smaller than .1000". For grinding, light drilling, inspection operations.



T-P COMPOUND SINE ANGLE

permits angular setup in two planes simultaneously. Just clamp part to tapped holes. Set angles with gage blocks. Tighten lockscrews to secure plates. Has same 6" x 6" base as Simple Sine Angle Plate.



T-P SINE BLOCKS

combine the features of a sine bar with a right angle iron. Tapped holes on all working surfaces facilitate clamping. Top surface parallel within .0001" to center line of sine plugs. 6" and 10" lengths standard. Specials to order.

For Checking



T-P SINE BLOCK TAPER TESTING FIXTURE

combines a 20" sine bar with pair of adjustable precision centers. Base is 14" x 24" precision surface plate fitted with adjustable end stop. Can check tapers up to 15" long and 6" in diameter.



T-P SINE BAR FIXTURE

puts sine bar on pivot. Pivot end may be raised or lowered independently of angle setting. Knurled-headed screws on pivot arm provide fine, accurate angular adjustment of bar. Available with 5" or 10" sine bar.



T-P SINE BARS

are used for measuring angles precisely or for locating work to a given angle within very close limits. Center line of sine buttons held accurately parallel to upper and lower face of bar. 3", 5", 10", and 20" standard lengths.

For more complete details on these and many other Taft-Peirce products, send for your copy of the Taft-Peirce Handbook.





THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

SPEED RECORD BROKEN

2,000 Horse Power

Motor Shafts

ROUGH and
FINISHED in

21/4 hrs.

Former Time
9 hours

Fairbanks, Morse & Co., Beloit, Wisconsin, is getting this amazing production day after day on its 20 inch "AMERICAN" All-hydraulic Duplicating Lathe.

These shafts are made from $7\frac{1}{2}$ diameter by 84" long hot rolled stock weighing 1059 pounds. A 30 horse power roughing cut and 15 to 20 horse power finishing cut completes the operation.

Note particularly that a finish turned motor shaft is used for a template, showing the rugged stability of "AMERICAN" Template Supports.

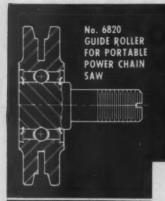
The quality of Fairbanks-Morse's products are universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to them. "AMERICAN" Hydraulic Duplicating Lathes hold many production records for work of this nature. Let us show you what they will do on your work.

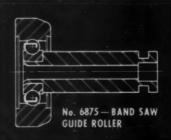
Send for Bulletin No. 35.

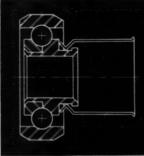
THE AMERICAN TOOL WORKS CO.

Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS







No. 6661 BEARING FOR IMPRESSION ROLLER SHAFT OF DUPLICATING MACHINE

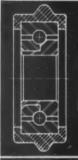


No. 6959
THREADED
O. D.
CADMIUM
PLATED
BEARING
FOR
RADIO
TUNING
DEVICE

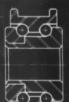




No. 6823 THEATER CURTAIN CONTROL ROPE SHEAVE



No. 7025 NYLON TIRED ZINC PLATED ROLLER FOR DISHWASHER



No. 6970 GUIDE ROLLER FOR SHEET METAL TRIMMER "Specials" are ball bearings which have been custom designed to be "exactly right" for a particular application. Thus, the field for specials ranges from modification of existing standard bearings to complete new bearings of unusual shapes and dimensions.

As "specialists in specials", experienced NICE engineers take advantage of every design opportunity to reduce costs and to improve product performance and appearance.

NICE invites inquiries on YOUR special requirements.



No. 6788 GRAVITY ROLLER CONVEYOR BEARING



No. 6768 BEARING FOR CONVEYOR ROLLERS

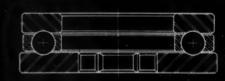


NICE BALL BEARING CO.

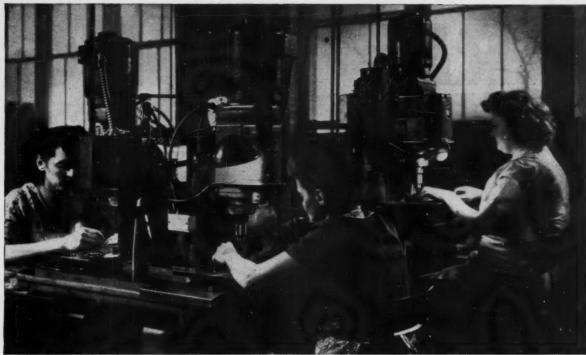
NICETOWN - PHILADELPHIA - PENNSYLVANIA



No. 6777 — BEARING FOR WHEELS OF MONORAIL TRACK TROLLEYS



No. 6579—THRUST BEARING FOR IMPACT WRENCH



Three Rockwell Drill Units have cut costs of machining Comptometer parts no larger than 36" diameter at Felt and Tarrant Manufacturing Company.

Rockwell* Drill Units Cut Costs 11% on Comptometer Parts Machining!

Mr. John Schmidt, Chief Tool Engineer at Felt and Tarrant Manufacturing Company states:

- "Our three Rockwell Drill Units handle 15 different automatic operations."
- "The Rockwell Drill Units have not only cut production costs by 11%, but they give us consistent accuracy to tolerances within .0005". Being

automatic, there's no chance for operator error in close tolerance work."

"We installed the Drill Units on low cost, shopfabricated mountings and fixtures, one an old drill press column."

You can match—or exceed Felt and Tarrant's cost savings through better methods in your drilling, tapping, counterboring and kindred operations with Rockwell Air-Hydraulic Drill Units. Let your Authorized Sales Engineer discuss possibilities with you. He not only offers engineering counsel, but can also demonstrate right in your plant. Send the coupon today for his name.



	ockwell Manufacturing Company on Avenue, Pittsburgh 8, Pa.
	e of nearest Authorized Sales Engineer atest Drill Unit Catalog.
Name	Title
Name Company	Title

ARASSER NC More Tools Per Man

Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now, with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

for

More Profit

See that each lathe, planer and shaper operator has the correct ARMSTRONG TOOL HOLDERS for each operation he performs. Equip each machine with its full complement of ARMSTRONG Setting-up Tools. Use better balanced, handier ARMSTRONG

WRENCHES on machines and assembly lines.

Specify ARMSTRONG Drop Forged "C" Clamps and
Lathe Dogs . . . Today, only quality tools can be truly economical.

Write for the ARMSTRONG Catalog. It has page after page of production-increasing, cost-cutting tools.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 W. ARMSTRONG AVENUE

CHICAGO 30, U.S.A.

New York and San Francisco

Armstrong Tools are Stocked by Industrial Distributors



MACHINE HIGH SPEED STEEL FORGINGS

Profitably... Automatically

AN ACTUAL CASE HISTORY

involving:

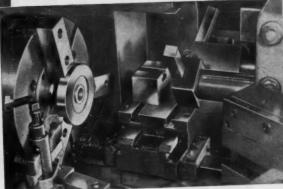
PART: 8" cutter blank, HSS forging

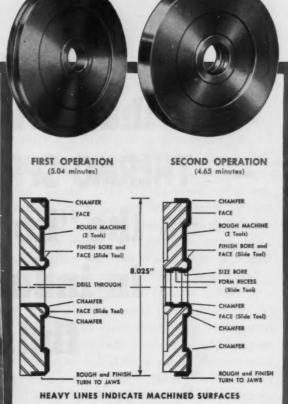
TIME: 9.69 minutes (floor-to-floor) for both operations

MACHINING: 24 separate rough and finish cuts, 11 in first oper-

ation, 13 in second operation

POTTER & JOHNSTON 4-U





The Potter & Johnston 4-U Automatic Turret Lathe is specifically designed and manufactured to give you the extra speed, power and rigidity needed to machine today's tough alloys faster, more economically. In addition, the 4-U is unusually versatile . . . combined with expert P&J Tooling, it offers new opportunities for increased profits on a wide variety of work types and sizes.

If your present equipment can't deliver performance like the job shown here, you owe it to yourself to learn more about the new 4-U Automatic.

SEND NOW FOR COMPLETE INFORMATION. Write direct or contact your nearest Pratt & Whitney Branch Office; ask for your copy of the 4-U Circular and the "34 Practical Production Ideas" Booklet — to help you increase output and reduce costs.



POTTER & JOHNSTON CO.

PRATT & WHITNEY

DIVISION NILES - BEMENT - POND COMPANY

RJ

FOR MORE THAN FIFTY YEARS

SIRMINGHAM • BOSTON • CHICAGO
CINCIBIEATI • CLEMELAND • DETROIT
LOS ANGELES • NEW YORK • PNILADELPHIA
PITTSBURGH • ROCHESTER • SAN
FRANCISCO • ST. LOUIS

EXPORT DEPT., PAWTUCKET, R. I.

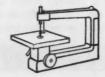
MOUSTON, WESSENDORFF, NELMS & CO.

that Lowe Brothers THERMO SPRAFIL system is the "hottest" news in industrial finishes today!

As a manufacturer of both hot and cold lacquer systems, Lowe

Brothers have found that the hot lacquer system is rapidly becoming the preferred system in an increasing number of manufacturing plants. The reasons?—Faster handling and lower cost
of all finishing operations. Here's a typical case history.





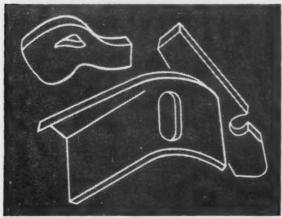


NOTE: This advertisement is based on facts from Lowe Brothers case history files.

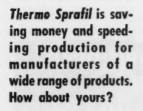
"case history" proof

CASE HISTORY: Thermo Sprafil System eliminates 3 baking operations—speeds up production!

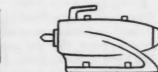
Wanting to speed the flow of heavy castings through his finishing operation, a large eastern manufacturer installed the *Thermo Sprafil* "hot" system at the suggestion of a Lowe Brothers "Finishing Specialist." Here's what happened: 1. Due to *Thermo Sprafil's* fast drying advantages, three separate bak-



Atlanta







ing operations were eliminated on every casting! 2. Sanding was eliminated! 3. All handling time and labor required to put castings through the three bakings were eliminated. 4. The three ovens were removed, releasing many square feet of vital factory floor space for other use. 5. Actual time required for complete finishing operation on each casting was cut from 12 to 4 hours

More and more manufacturers are seeing proof that Lowe Brothers Thermo Sprafil System provides the finest in finishing results while eliminating many of the costly and time consuming features of old cold lacquer systems. Get full details about the modern Thermo Sprafil System. Let a Lowe Brothers "Finishing Specialist" give you his recommendations based upon complete knowledge of the most up-to-the-minute finishing developments. No obligation. Why not write for more information today?

THE LOWE BROTHERS COMPANY • Dayton 2, Ohio
Industrial Division
District Offices:
Atlanta, Boston, Chicago, Jersey City, Kansas City



CATERPILLAR TRACTOR CO.

is commemorating throughout 1954 the fiftieth anniversary of the track-type tractor . . . and Texaco is happy to join the celebration. For nearly twenty-five of those "Fifty Years on Tracks," Texaco Lubricants and Lubrication Engineering Service have been helping Caterpillar keep its production high, its costs low.



N MACHINING, for example, Caterpillar has long used Texaco Soluble Oils. They assure better cutting, better finish and longer tool life because emulsions are more stable, and cool and lubricate better. They also assure a cleaner plant and lower oil consumption.

In addition, the know-how of Texaco Lubrication Engineers and their interest in keeping abreast of Caterpillar's problems have been help-

ful factors in achieving maximum machining efficiency.

Why not enjoy the benefits of Texaco Lubricants and Lubrication Engineering Service in your plant? They are available everywhere. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO SOLUBLE AND

CUTTING, GRINDING, HYDRAULIC OILS

. . . TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE on television . . . Saturday nights, NBC.

154-MACHINERY, November, 1954

For more information on products advertised, use Inquiry Card, page 265



By LORING F. OVERMAN

Productive Capacity and Obsolescence Complicate Defense Program

TROUBLESOME problem in A Washington is the realization that when plants are geared, as they should be, to meet the expanded requirements for an emergency, their products soon exceed peacetime needs. Also, new scientific discoveries are constantly hastening obsolescence of the product-its method of manufacture or even the place in which it is being produced.

Take plant dispersal, for example. It was once thought that plans should be made for a target radius of 10 miles. Then came the H bomb, and plans for safe locations had to be revamped. Both the Federal Civil Defense Administration and the Defense Department have been asked by Dr. Arthur S. Flemming, Chief of the Office of Defense Mobilization, to determine a satisfactory substitute for the 10-mile concept of dispersal.

PENDING such dispersal regulations, the ODM is not suggesting any wholesale movement of plants. But when new plants are to replace obsolescent ones, they will be located away from industrial centers. The question of stockpiling end products or semi-finished items in safe spots is being considered, as is protective construction for existing plants.

Operation Obsolescence

Happenings at the Republic Aviation plant at Farmingdale, L. I., illustrate the effect of obsolescence. Because of difficulties in getting scheduled delivery of airframes and jet engines to coincide, production of finished planes was delayed materially. Meanwhile, new F-100 planes proved so much better than the F-84's on which the Long Island plant was working that it was decided to substitute the F-100 for the F-84. In this instance, the United States Air Force will wind up with better planes and the Nation with better defense weapons.

Operation Improvement

Under a recent reorganization in the Office of the Defense Secretary. the task of materials conservation was assigned to Assistant Defense Secretary Frank Newbury. An example of how materials conservation works was reported recently to Capitol Hill. The claim is made that redesign of the J-48 jet engine will save \$10,000 per engine in machine time and metal. Under conditions of full mobilization, it is estimated that the Defense Department would save approximately \$278,000,000 annually on this engine alone.

Operation Home Front

Another problem is the fact that machines can turn out new and improved weapons faster than men can be trained to handle them. The original schedule of the Air Force called for 127 wings by the end of fiscal year 1956, and 137 wings by the end of fiscal '57. Delivery of the required number of planes is no longer a question. Instead, the problem is whether bases will be ready, and whether sufficient manpower will be available. Discussing this subject recently, Air Force Chief of Staff General Nathan F. Twining said, "During the next fiscal year we have to add ten new wings and establish about eighty radar sites. To do this will require about 40,000 additional men in uniform; yet we are programmed to increase our forces by only 5000.

"To accomplish this, we have two 'operations' in force-Operation Native Son, and Operation Home Front. The first, substituting French, British, Japanese, and German civilians for United States Air Force personnel, has saved us almost 50,000 uniformed personnel overseas. Operation Home Front will substitute civilians for certain military jobs

here at home.

"Hundreds of similar but smaller projects are also under way. By a new actuarial system, we can save \$100,000,000 annually on B-47 engines alone. A new vehicle inspection method will save yearly about \$26,000,000. Of course, these programs are always limited by the measuring stick of fighting ability, but by watching the corners, and adopting the newest proved substitutes for outdated methods and ma-

terials, we expect to be able to conserve manpower and money."

Operation Economy

With all of these braking influences at work, it seems inevitable that military spending for fiscal 1955 will be down-even lower than preliminary estimates. Current estimates are that about \$35,500,000,000 will be spent in fiscal 1955, as compared with \$40,000,000,000 in fiscal 54, and \$37,500,000,000 estimated last January as the total for '55.

The difference in estimates is accounted for largely by reduced spending for heavy procurement, and for maintenance and operation. Army spending cuts account for about half the total reduction, with the Air Force down \$800,000,000. However, Navy expenditures are not expected to change much from orig-

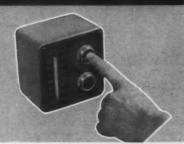
inal estimates.

Defense spending for production equipment will be down again in fiscal 1955, according to estimates of W. J. McNeill, Assistant Defense Secretary. Present estimates call for spending \$615,000,000 during 1955 as compared with \$1,100,000,000 during fiscal 1954 and \$1,700,000,000 in the peak year, 1953. He explained the drop as follows: "The facilities expansion program necessitated by the defense build-up has been substantially completed. Future expenditures for this purpose will be primarily for new weapons facilities and mobilization readiness."

HE Air Force is again sending up trial balloons, figuratively speaking, to test possible reactions to another drive for authority to construct a 75,000-ton forging press capable of turning out huge wing sections. This press was part of the original program but was ruled out. As a result, construction of two 50,000-ton forging presses and several extrusion presses was speeded up. The 50,000-tonners are nearing completion, and the extrusion presses are progressing rapidly. The Military is so favorably impressed with the operation of smaller pilot presses that it is hoping for new action on the 75,000-ton press.

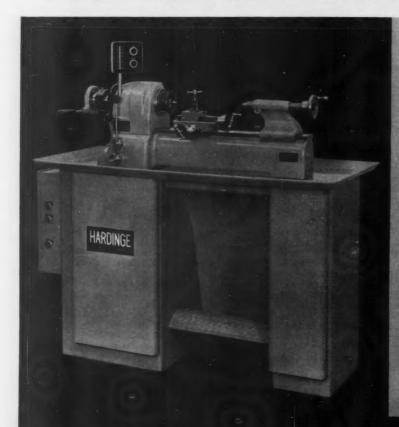


NEW Lathe with Variable Speed for Tool Room—Development—Production Work



Simply Push a Button for Exact Spindle Speeds

It's the NEW Simplified Design EASY AND CONVENIENT TO OPERATE



FEATURING:

- Infinitely Variable Speeds 230 to 3500 r.p.m.
- Fast Lever Operated Collet with 1%"
 Capacity
- Hardened and Ground
 Steel Dovetail Bed Ways
- Patented Positive Lock
 Slide Rest
- Full Bearing Tailstock
- And Other Cost Cutting Features

For Complete Information on this Precision Lathe Write for Bulletin DV59

HARDINGE BROTHERS, INC., ELMIRA, N.Y.

OFFICES IN PRINCIPAL CITIES. Expert Office: 269 Lafayette St., New York 12, N. Y.

A Memorable Year Abead for the Automobile Industry

THE automobile industry, each company eager to catch the public eye, is getting an early start in introducing the new car models for the coming year. Most of them will be shown to the public during this month. Styling and mechanical changes will be the most extensive in twenty years as the various companies struggle to maintain a dominant position in the market or to gain a greater proportion of the business. Seven of the 1955 models will be equipped with V-8 engines for the first time, six of these engines being of completely new design. More torque converter transmissions will be featured. At least ten cars will have all-new bodies.

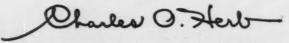
The obvious improvements in automobiles will attract prospective buyers but they will know comparatively little of the technical problems that had to be solved by the engineers and production men of the industry in order to make possible these cars with little or no advance in cost. The reason modern automobiles can be sold at prices that the average person can afford to pay is due, as in the past, to the ingenuity of the production engineers in the automobile industry and the builders of machine tools, tooling, and other manufacturing equipment.

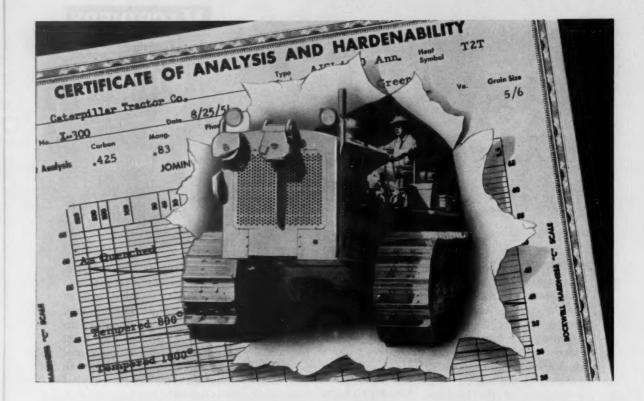
To emphasize the tremendous changes in production methods that have occurred dur-

ing the history of the automobile industry, it may be pointed out that in 1912 one shop used 162 machines to finish four flat surfaces on 108 cylinder heads per hour. The machine, fixture, and cutter investment amounted to approximately \$243,000. Today, one huge horizontal broaching machine that cost \$230,000 finishes the cylinder heads at an even faster production rate. The total capital investment cost is not only less but the labor costs have been tremendously reduced despite the vastly higher pay rates and the greatly reduced purchasing power of the dollar.

Many millions of dollars have been spent in recent years by the automobile industry and are contemplated for the period immediately ahead to take advantage of the opportunities offered by the latest types of production machinery. Some of the modern machine tools that will produce next year's cars are shown in action in this Annual Automotive Production Number. The operations that are performed are described in detail.

The various articles should be of considerable help in the solution of production problems, not only in automobile plants but throughout the metal-working industry. In other words, what makes the automobile industry great can aid various industries.





Caterpillar quality control inspires Ryerson certification

It was 1935—Caterpillar pioneering in quality control—was concerned about the uniform quality of alloy steels from warehouse stock.

Ryerson wished to serve its customers in the best possible manner. We sent our metallurgists to Caterpillar and asked them what could be done that wasn't being done.

Caterpillar pointed out that in the heat treatment of parts there can be as much difference in behavior between two mill heats of the same type composition as between two heats of different type composition. To emphasize this fact, they cited a statement in the AISI Manual that it would be false and misleading to assume all steels of a given composition are the same.

Ryerson accepted the challenge and began laying the groundwork for a quality control program which would include—1. selecting mill heats, 2. spark testing and carefully segregating every heat, 3. identifying each heat by heat symbol, 4. color marking for AISI number, 5.

testing for hardenability in our own laboratory, 6. interpreting hardenability, 7. final inspection before shipment, 8. furnishing Certificate of analysis and guide to heat treatment.

After two years of preparation—we announced the Ryerson Certified Alloy Steel Plan in 1937. And now—not only Caterpillar but all other alloy steel users can buy high uniform quality alloys from Ryerson warehouse stocks with complete confidence. The plan takes time and money but has been helpful to Caterpillar—and we believe—even more helpful to companies without the elaborate testing facilities of Caterpillar Tractor Co.

It just happens that Ryerson is one of four companies that have been serving Caterpillar since their founding—so we are particularly happy to tell this story of progress in quality control—inspired by Caterpillar on this, their 50th anniversary of service to America and to the world.

Principal products: Bars, structurals, plates, sheets, tubing, alloys, stainless, reinforcing, machinery, & tools, etc.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK . BOSTON . PHILADELPHIA . CHARLOTTE, N. C. . CINCINNATI . CLEVELAND DETROIT . PITTSBURGH . BUFFALO . CHICAGO . MILWAUKEE . ST. LOUIS . LOS ANGELES . SAN FRANCISCO . SPOKANE . SEATTLE

158-MACHINERY, November, 1954

For more information on products advertised, use Inquiry Card, page 265

AUTOMOTIVE PRODUCTION NUMBER

Vol. 61 No. 3

Photo Courtesy Ford Motor Co.

MACHINERY

November, 1954

AUTOMOTIVE PRODUCTION NUMBER

Modern Tooling Produces Pontiac's New V-8 Engine

Provided with the latest automation equipment and the most modern machine tools, Pontiac's new V-8 engine plant has been called "a showplace of the automotive industry," and is capable of producing more than 150 engines per hour. First of two installments

By BUEL E. STARR
General Manufacturing Manager
Pontiac Motor Division
General Motors Corporation
Pontiac, Mich.

NE of the newest V-8 engines to be introduced in the automotive industry is Pontiac's Strato-Streak. This engine is being manufactured in an ultramodern plant featuring the latest type automation equipment, transfer machines, and other automatic machinery capable of turning out more than 150 assemblies per hour. Also, unique methods have been developed for producing some of the engine parts. For example, new type transfer machines for the manufacture of connecting-rods are being used for the first time.

Engine blocks are processed on either of two duplicate lines of transfer machines. The castiron blocks pass progressively through two multiple-station Ingersoll transfer machines, then through three multiple-station Greenlee transfer machines before the bearing caps are assembled. Automation devices are provided between successive machines to automatically unload, transfer, and load the castings.

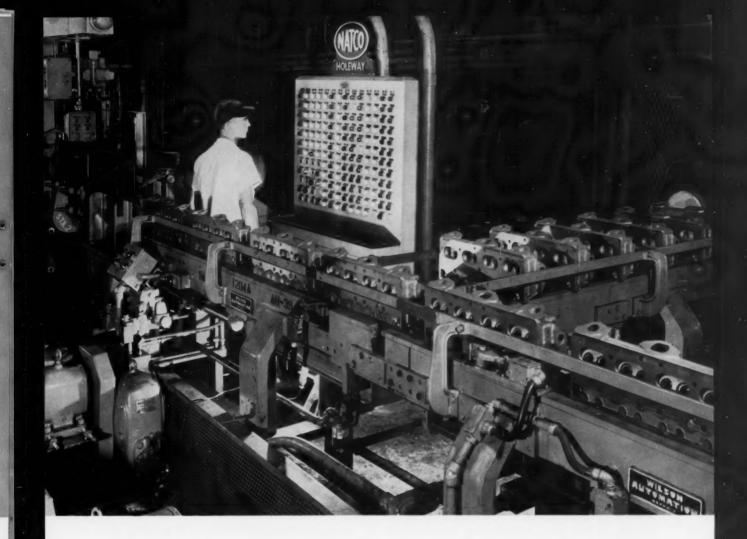
Many idle stations and spindles have been provided on the transfer machines to take care of possible changes in engine block design. Cross tool-control boards are located at various points along the line. These boards have production

counters (electrically connected to the machines) with dial indicators that show when the tools require changing. Gages on the boards are used to pre-set tools in their holders.

Certain stations on all the transfer machines are used for automatically indexing or turning over to position the blocks for subsequent machining, or to dump chips. Other stations are employed for automatic inspection of previous machining. Dry chips are neatly and quickly disposed of by underfloor conveyors extending throughout the plant, while wet chips are carried away by sluice systems. To remove dust, overhead ventilation ducts are provided for all machines working on cast-iron engine parts.

On the first Ingersoll machine, Fig. 1, four locating spots on the engine block are milled; the half crank bearings and rear cam bearing are rough-bored; the pan rail surface is rough, semi-finish-, and finish-milled; and various holes are drilled and reamed. The block is turned over 180 degrees at the third station, Fig. 2. At station 9, the pan rail surface is automatically inspected by means of a special fixture.

Front and rear ends of the crank bearings, five bearing notches, and an oil-filter pad are



milled on the second Ingersoll ten-station transfer machine. In this same operation, the bank surfaces of the block are rough- and semi-finishmilled, and the eight cylinder holes in each casting are rough-bored. Inspection of machined surfaces is performed at the station seen in Fig. 3. An outstanding feature of this transfer machine is that milling is performed at the unusually high feed rate of 102 inches per minute.

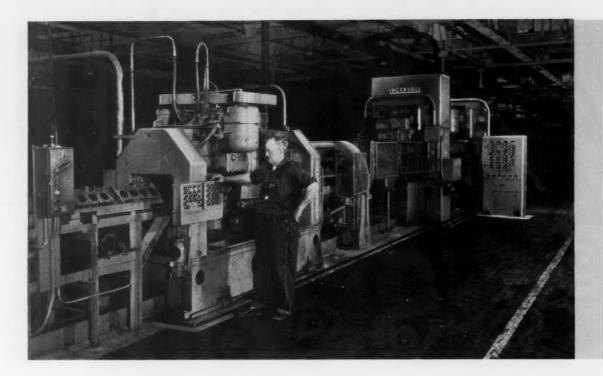
The third Ingersoll transfer machine contains sixteen stations for rough-, semi-finish-, and finish-milling both front and rear ends of the blocks; boring two holes; drilling and chamfering sixty-six holes—including the oil galleries; sawing a notch; and reaming three holes. Drilled holes are automatically inspected with a special fixtures, oil gallery holes are air checked, and unsatisfactory blocks are rejected.

All the remaining drilling operations, with the exception of those required in the ends of the blocks, are performed on three multiple-station Greenlee transfer machines. The blocks are automatically transferred into the first machine, Fig. 4, loading with the pan rail up and front end leading. Sixty-four holes—including bearing cap screw, pan rail screw, filter pad, bolt, dip-

stick, oil-pump, and distributor shaft holes—are drilled. Many of the holes are countersunk, and some are bored and reamed. At Station 13, the blocks are rolled completely over to dump out the chips, and, at Station 20, they are turned over 180 degrees so that they proceed through the remainder of the machine with their pan rails facing down. The depths of the holes to be subsequently tapped are automatically checked by means of probes mounted in a special fixture at Station 19.

On another Greenlee transfer machine, sixteen tappet holes are spot-drilled, fifty-nine holes are drilled, thirteen are countersunk, twenty are reamed, and two are chamfered. The engine blocks are turned over 360 degrees at Stations 13 and 24, and holes to be tapped are checked for depth at the twenty-fifth station. A third Greenlee transfer machine, having fifteen stations, is then employed to tap sixty-seven holes, and semi-finish- and finish-ream sixteen tappet holes, using carbide reamers.

After inspecting and washing the engine blocks, dowels are pressed in place and bearing caps assembled. Special Hautau torque-control assembly machines equipped with two-speed



hydraulic torque wrenches are employed to secure the caps to the blocks.

Two more Ingersoll transfer machines, one containing fourteen stations and the other, ten stations, complete most of the machining on the blocks. At Station 1, cam pockets are inspected automatically, and blocks having cam pocket interference are rejected. Cam and crank bearings are faced, bored, and counterbored, and oil slinger and oil seal grooves are turned on this first machine. On the second transfer machine, cam bushings are pressed in place and bored;

dowel holes are reamed; bank surfaces are finishmilled and inspected automatically; tops and bottoms of the cylinder bores are chamfered; and the eight cylinder bores in each block are semifinished.

Automation is again employed to transfer the blocks and load them into two Micromatic hydraulically operated, duplex, eight-spindle honing machines, Fig. 5. In the first of these completely automatic machines, the eight cylinder bores in each block are all rough-honed simultaneously. Finish-honing of the cylinder

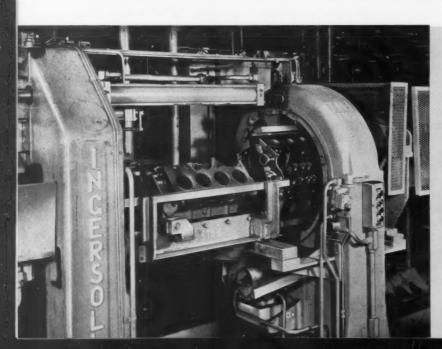
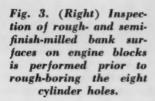
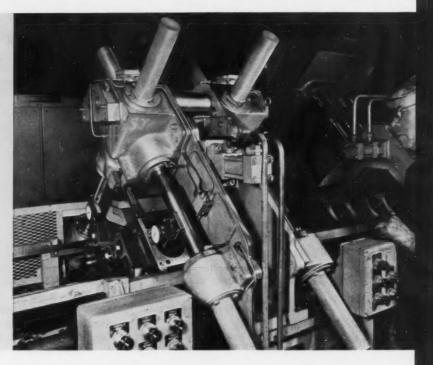


Fig. 2. V-8 engine block is turned over 180 degrees at this third station of the transfer machine seen in Fig. 1. Automatic inspection is performed at a subsequent station.

Fig. 1. (Left) Loading end of the first multiplestation transfer machine which mills, bores, and drills various surfaces of the V-8 engine blocks.





bores is performed in the second automatic machine. Crank bearings are then honed on Micromatic single-spindle honing machines.

On the Sheffield multiple-column, Precisionaire inspection machine seen in Fig. 6, diameters, out-of-roundness, taper, and bell-mouth of all eight cylinder bores in the engine block are checked, four at a time. All bores are classified and stamped for selective assembly with matching pistons.

Pratt & Whitney air gages, seen in the foreground of Fig. 6, are used to check the distribu-

tor shaft holes, squareness of the tappet holes, size and alignment of the cam bore bushings, and squareness of the cylinder bores. After being washed, the blocks pass through a final Ingersoll nine-station transfer and assembly machine. In this machine, sealer is applied, welch plugs are pressed in place, the blocks are airtested, and blocks that leak are automatically marked for subsequent rejection. Locating lugs used solely for manufacturing purposes are also milled off in this machine. After final inspection, the blocks are ready for engine assembly.

Fig. 4. This multiple-station transfer machine, together with another similar one, performs all the remaining drilling operations in the top and bottom surfaces of the V-8 engine block.



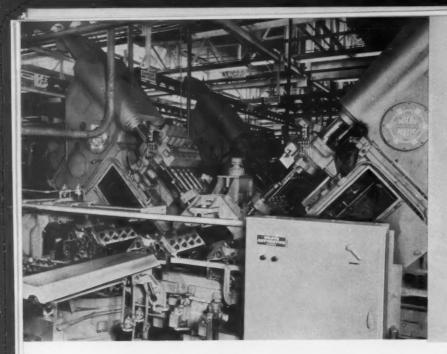


Fig. 5. Hydraulically operated, duplex, eight-spindle honing machines are employed to rough and finish the cylinder bores in the engine blocks.

All machining of the engine blocks is performed dry with the exception of finish-boring and honing of the cylinder bores. For these operations, kerosene is employed for cooling and lubrication purposes. The kerosene flows through a Delpark central filtration unit, Fig. 7. Special disposable filtering paper, supplied in rolls, removes cast-iron chips and dust, as well as abrasive and foreign particles, from the coolant. A continuous mesh conveyor over the tank supports the filter paper as it is unrolled, and the used paper falls into a container at the end of the unit. Clean coolant is recirculated by pumps

through a refrigeration system—which maintains it at a temperature 20 degrees F. below that in the plant—and back to the machines.

Exhaust, intake, and joint faces of the castiron cylinder heads are both rough- and finish-broached in one cycle on the Cincinnati two-way horizontal broaching machine seen in Fig. 8. One joint face and the exhaust surface on the head are rough- and finished-broached as the ram moves to the right. At the end of the stroke, the hydraulic work-holding fixture is automatically transferred to the second station and the casting is rotated 180 degrees. As the ram returns

Fig. 6. Multiple-column inspection machine for checking cylinder bores. Bores are classified and stamped for subsequent selective assembly with matching pistons.



to the left, the intake surface and other joint face are rough- and finish-broached.

This huge broaching machine is equipped with a rack-and-pinion, planer type drive, powered by a General Electric 75-K. W. motor-generator set which permits broaching with ram speeds up to 200 feet per minute. Approximately 3/16 inch of stock is removed from each of the four surfaces by a total of 876 square carbide-tipped inserted bits for rough-broaching, and 56 carbide blades for finish-broaching.

Most of the drilling and reaming of holes in the cylinder heads is done on two Natco multiple-station transfer machines. On the first machine, seen in the heading illustration, seventynine holes are drilled, twenty-two are reamed, eight are chamfered, four are counterbored, and eight are spot-faced. Included are water, stud, dowel, push-rod, cover, valve throat, spark plug, and valve guide holes. Also, on the same machine, both ends of the head, the four combustion chambers, and the ends of the eight push-rod holes are milled. Stations 9, 24, 29, and 30 of the transfer machine are used for automatic inspection of the holes. The heads are rolled over at Station 17 to dump the chips.

As the cylinder heads are automatically unloaded and conveyed to the second Natco transfer machine, they pass through an inspection station where automatic gages are provided for checking the location of holes in both ends and tops of the heads, and depths of the valve throats. On this transfer machine, thirty-seven holes are drilled, sixteen are chamfered, and four are reamed. Inspection is performed at Stations 15 and 23, and oil galleries are tested for leaks at Station 16. Heads in which leaks are detected are automatically rejected at Station 17.

Automation is again employed to transfer the cylinder heads into a W. F. & John Barnes multiple-station transfer machine, Fig. 9. Here the valve guide holes and throats are bored; eight holes are drilled; thirty-two holes are reamed; eight are spot-faced; and eight are burnished. At Station 8, the eight valve guide bushings are inserted in the heads by means of a Colonial press.

Joint faces on the cylinder heads are finishbroached on a Lapointe horizontal broaching machine, and the four combustion chambers in each head are finish-milled on a Cincinnati profile-milling machine. Machining of the heads is completed on a W. F. & John Barnes multiplestation transfer machine. A total of twenty-two holes (including the four spark plug holes) are tapped, the four spark plug holes are chamfered, and two more holes are drilled in this operation.

After a final washing, welch plugs are assem-

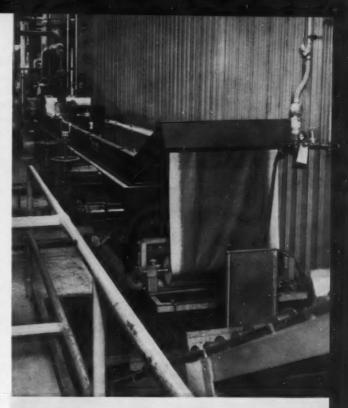


Fig. 7. Kerosene employed as a coolant for finish-boring and honing of the cylinder bores is filtered through disposable paper in this central unit.

bled and the heads are air-tested on the unusual Snyder assembly machine seen in Fig. 10. Rubber plugs are employed for sealing the cylinder head to permit air-testing, and the welch plugs are hopper fed into position for assembly.

A completely different process has been developed for manufacturing connecting-rods. The rods are being produced for the first time on new type transfer machines incorporating automatic inspection stations, bushing assembly, and burnishing operations. Extremely accurate alignment of bolt holes in both rods and caps is obtained (even though the caps are not kept with the rods) by accurately nesting the work-pieces in their fixtures. With this set-up, the pressure exerted in clamping the parts, and consequent distortion, is kept at a minimum.

Crank and pin bosses on the forged manganese steel (SAE 1335) connecting-rods are roughground on two Mattison vertical spindle grinding machines, one machine being used to grind each side. The rods are automatically unloaded from the second grinder into a Sheffield inspection machine, and then conveyed to a Footburt 15-ton, continuous, chain type broaching machine. Here the weight and bolt bosses on the

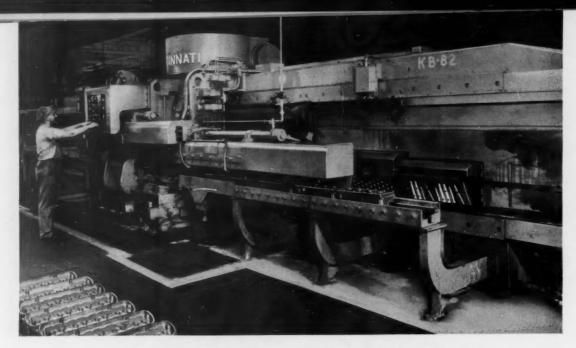


Fig. 8. Two-way, horizontal broaching machine with mechanical drive for cutting exhaust, intake, and joint faces of cast-iron cylinder heads. Stock removal is 3/16 inch.

crank ends of the rods are broached, holding over-all width to plus or minus 0.001 inch. The sides and weight bosses on the pin ends are broached on a Footburt 5-ton, continuous broaching machine.

Then the rods are placed on the first transfer machine, a Greenlee multiple-station pallet type machine seen in Fig. 11. Rods are loaded eight at a time on each pallet fixture, with their crank ends up. The parts are automatically clamped, with a controlled-torque fixture, at the second station. When the pallet containing the eight rods has been transferred to Station 3, the cap

ends of the elongated crankshaft holes are rough-bored with six-blade boring cutters, and the 1-inch diameter pin-holes are drilled halfway through.

Pin ends of the elongated crankshaft holes are rough-bored, and the pin-holes are drilled through, at Station 4. The pin-holes are checked at Station 5 to insure that they have been drilled through. When the pallet carrying the eight rods has been transferred to Station 6, the pin-holes are semi-finished-reamed. Both sides of the pin-holes are chamfered at Station 7. At the next station, eight saws, 6.12 inches in diameter, are

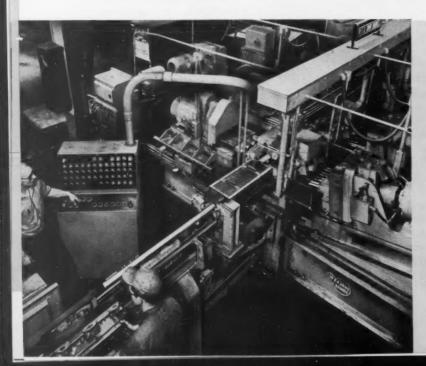


Fig. 9. (Left) Valve guide holes, throats, and generator seat are bored; and fifty-six holes are spotfaced, drilled, reamed, or burnished on this multiple station machine.

Fig. 11. (Right) Pallet type transfer machine for boring, drilling, reaming, and chamfering connecting-rods; and then separating the caps from the rods by saving.

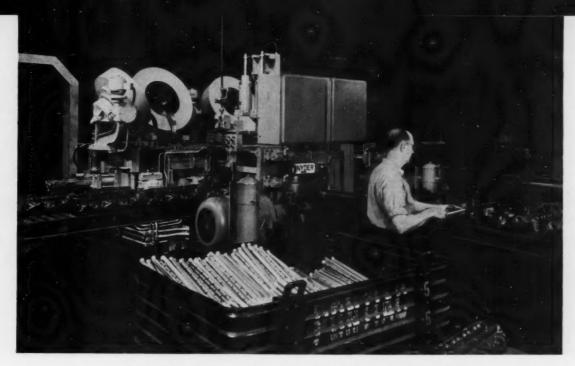


Fig. 10. Rubber plugs are employed for sealing cylinder head to permit air-testing, and welch plugs are hopper fed into position on this assembly and testing machine.

employed to separate the caps from the rods. Automatic unclamping and ejection of the parts are performed at Station 9, and the empty pallets are returned on a parallel conveyor to the loading station.

After checking on a Sheffield automatic inspection machine, the rods and caps (which are not kept together after sawing apart on the previous machine) are placed on either of two Greenlee multiple-station transfer machines, one of which is seen in Fig. 12. The caps and rods are loaded on the transfer bar of the machine at the first station, the caps being carried

on the one side, and the rods on the other side of the bar. First, the bolt holes are drilled halfway through the rods and caps, and oil-holes in the pin ends of the rods are counterbored. Then, the bolt holes and the oil-holes are drilled through.

The bolt holes are automatically checked to insure that they have been drilled through the rods and caps at Station 4. At Station 5, bolt holes in the pin-hole sides of the rods and on the joint faces of the caps are chamfered, and lock slots are milled in the rods. Oil "spit" slots are milled with form cutters at Station 6.

When the parts have been transferred to



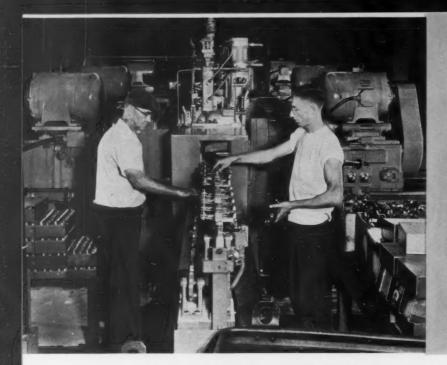


Fig. 12. Bolt holes and oilholes in both the connecting-rods and caps are completed on this multiplestation transfer machine. The holes are automatically checked at fourth station.

Station 7, lock slots are milled in the caps; one bolt hole in the rod is chamfered and the other bolt hole is counterbored; and a hole 0.406 inch in diameter by 0.820 inch deep is counterbored in the cap. Bolt holes in both the caps and rods are semi-finished by reaming at Station 8, and finish-reamed at Station 9. The caps and rods are automatically unloaded at the tenth and final station, onto a conveyor leading to two Mattison vertical spindle grinders. One machine grinds the joint faces of the rods, and the other, the joint faces of the caps.

After being washed and blown off as they are conveyed through a washing machine, each cap is assembled to a rod by pressing in two bolts and tightening two nuts on the bolts. Hautau special assembly presses and hydraulic nut drivers are employed for this operation, the torque

applied in tightening the nuts being controlled between 45 and 50 pounds.

Connecting-rod and cap assemblies are loaded pin ends up into either of two Greenlee thirteen-station transfer machines. In these machines, both sides of the crankshaft holes and pin-holes are chamfered, the crankshaft holes are semi-finish-bored, and the pin-holes are finish-reamed. A Sheffield automatic inspection unit is built into Station 7 of the transfer machine, Fig. 13, to check the size of the pin-holes. Rods having under-size or over-size pin-holes are automatically ejected at Station 8.

Hopper fed bushings are hydraulically pressed in the pin-holes at Station 9, and the bushings are burnished at Station 10. Burnishing is accomplished by pushing a carbide ball through the pin bushing. The machine is so arranged that

Fig. 13. Automatic inspection unit built into seventh station of a transfer machine to check the pin-hole size. Under-size or over-size rods are ejected at next station.

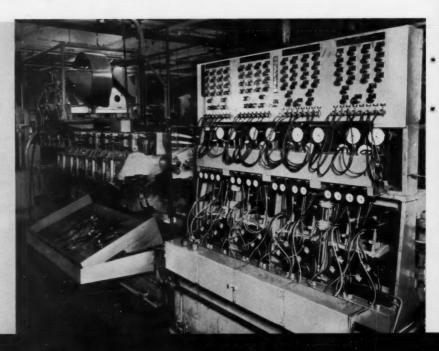




Fig. 14. Double-acting, mechanically driven, horizontal broaching machine for broaching half-round bearing surfaces, edges, and joint faces of crankshaft bearing cap clusters.

the eight carbide balls (one for each connectingrod assembly) are pushed through the bushings from left to right in one cycle, then reversed in the next cycle. In this way, only eight balls are required, and they do not have to be recirculated. At subsequent stations on this final transfer machine, an oil-hole 0.1875 inch in diameter is drilled in each pin bushing, both sides of the pin bushings are chamfered, and the connecting-rod assemblies are automatically unloaded.

Connecting-rod assemblies are automatically balanced by weighing and burred on special Motch & Merryweather milling machines. Two Mattison vertical spindle grinding machines are employed to finish-grind the step on each side of the rod. The crankshaft holes and pin-holes are finish-bored on Ex-Cell-O single-end boring machines, holding pin-hole size within 0.0004 inch, and taper and out-of-roundness to 0.0001 inch. Approximately 0.0005 inch of stock is removed from the crankshaft hole in an operation performed on a Micromatic turret honing machine, and the bore size and squareness are maintained within 0.0005 inch. Pin-holes are "Bearingized" on a Hesco special four-spindle machine, and the connecting-rod assemblies are given a final inspection prior to assembly in the engines.

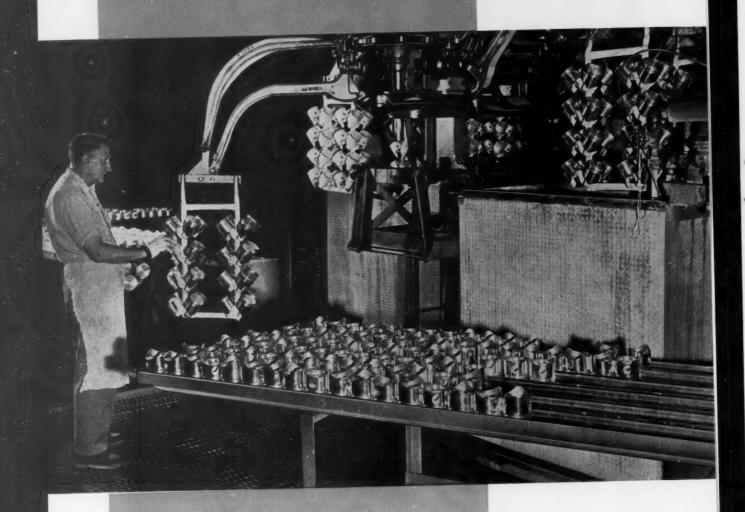
Crankshaft bearing caps for the Strato-Streak V-8 engine are cast from close-grained cast iron in clusters, each containing five caps. The half-round bearing surfaces, edges, and joint faces of the cap clusters are broached on the Colonial double-acting, mechanically driven, horizontal broaching machine seen in Fig. 14. Two bearing

cap clusters are machined at a time, removing 3 1/2 pounds of stock with depths of cut varying from 5/32 to 3/16 inch.

The 25-ton planer type broaching machine has a 130-inch stroke, and the ram travels at 142 feet per minute. Ram speed is variable from 30 to 150 feet per minute through rheostat control of a 150-H.P. direct-current motor. Bearing cap clusters are hydraulically clamped in a trunnion type shuttling fixture that permits broaching on both the forward and reverse strokes of the ram. The ram is equipped with a total of 340 tung-sten-carbide tipped tool bits for broaching the various surfaces, plus twenty carbide blades for shaving the joint face of each casting. The broaching cycle requires only twenty-one seconds to complete two clusters containing ten bearing caps.

Machining of the crankshaft bearing caps is completed on either of two Natco twenty-station transfer machines. Cap clusters are successively faced, drilled, reamed, chamfered, spot-faced, grooved, notched (for lock slots), and tapped before being separated into individual caps by tungsten-carbide tipped saws, 7 inches in diameter by 0.34 inch wide, at Station 19. An automatic inspection fixture at Station 6 checks the depth of twenty-three previously drilled holes by probing.

Other interesting operations performed on modern machine tools in producing crankshafts, camshafts, pistons, and other parts for the Pontiac V-8 engine will be described in the concluding installment of this article.



Dodge Finishes Pistons By Turning

By B. W. BOGAN, Chief Engineer
Dodge Division, Chrysler Corporation
Detroit, Mich.

Rough elliptical turning of the piston skirts on an eight-spindle automatic chucking machine, and semi-finish- and finish-turning on a specially equipped precision boring machine, have eliminated the need for cam grinding operations while improving the quality of the pistons produced

A LTHOUGH it has been conventional practice with most of the automotive engine manufacturers to employ cam grinding for imparting an elliptical cross-section to piston skirts, the Dodge Division of Chrysler Corporation has obtained excellent results by elliptical turning. The piston skirts are rough elliptical turned on eight-spindle automatic chucking machines, and semi-finish- and finish-turned on especially equipped precision boring machines. The accuracy maintained and smooth surface finish produced by a combination of carbide and diamond tooling in these operations have made grinding unnecessary, and improved the quality of the pistons.

The aluminum-alloy pistons manufactured at Dodge are permanent mold castings. The peripheries of the castings are rough-turned and their head ends are rough-faced at the foundry. New Britain four-spindle automatic chucking machines are employed to rough- and finish-bore, counterbore, and chamfer the pistons. Also, the balance weight bosses cast in the piston are rough- and finish-faced for manufacturing purposes on these machines.

Pistons are placed manually on a reciprocating loading ram mounted on the main tool-slide of the machine, and the ram loads the pistons into four-jaw chucks mounted on the indexing headstock. Accurate location is insured by spring-loaded plungers provided on the faces of the chucks, which seat the pistons against their cast locating surfaces on the bottoms of the heads.

For finish-boring and counterboring at the fourth station of these machines, work rotation is stopped and machining performed by a motor-driven precision boring spindle. Rotation of the boring-bar provides a cutting speed of 2863 feet per minute on the 3.125-inch diameter bore. The bar is fed at the rate of 0.0023 inch per revolution. This arrangement avoids any inaccuracies that might be introduced through headstock indexing or work-spindle rotation. Also, clamping pressure exerted at the fourth station is automatically reduced to prevent distortion.

Wrist-pin holes in the pistons are rough-bored and chamfered, and the two lock-ring grooves in

each piston are formed, on New Britain doubleend, six-spindle precision boring machines. Three pistons are machined at a time in this operation. Adapters with hydraulically operated pivoted heads are provided for the flange type boring-bars on these machines.

Pistons are placed on a conveyor and air blasts automatically remove chips from the castings as they travel to New Britain eight-spindle automatic chucking machines, such as the one seen in Fig. 1. The piston is loaded on an adapter and a dummy wrist-pin is manually pushed through the wrist-pin holes in the piston and a mating hole in the adapter. The adapter, connected to a draw-bar mechanism, pulls the piston back to seat its previously machined balance weight bosses against locating surfaces on the work-holding fixture.

After the piston has been indexed to the second station (shown diagrammatically at the left in Fig. 2), the head end is rough-faced up to the center boss, the skirt end faced, the head end rough-turned for the required land diameters, and the boss on the head end center-drilled. A motorized spindle and a special tool-holder are mounted on the main slide for center-drilling. The head end of the piston is then finish-faced up to the center boss at the third station, where a spring-loaded, anti-friction support center is applied to the boss for increased rigidity.

At the fourth station, the three ring grooves in each piston are rough-formed. The periphery of the piston skirt is rough-turned, and the ring lands and head end are chamfered at the fifth station. After the piston has been indexed to the sixth station, the three ring grooves are finish-formed and the lands are finish-turned.

Both ends of the piston skirt are chamfered elliptically at the seventh station, and the skirt is semi-finish contour-turned to an elliptical cross-section at the eighth station. These contour-turning and chamfering tool-holders are linked to follower rolls that contact eccentric bushings on the spindle adapters.

All tools with the exception of the center drill are tungsten carbide-tipped—including the form chamfering tool used at the fifth station. The pistons are rotated at 1030 R.P.M., providing a

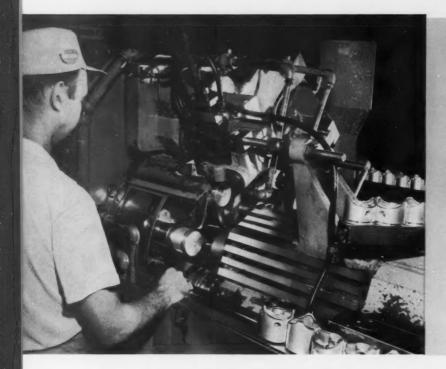


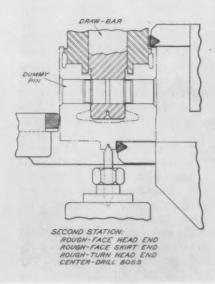
Fig. 1. Majority of the machining on cast-aluminum pistons, including rough elliptical turning, is done on this eight-spindle automatic chucking machine.

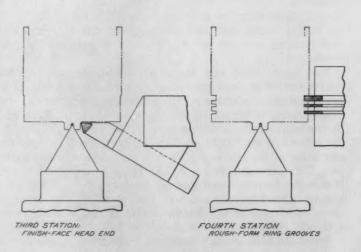
maximum cutting speed of 939 feet per minute in turning the 3.482-inch diameter, and a minimum of 109 feet per minute in center-drilling the 0.093-inch diameter. A feed rate of 0.0171 inch per revolution is provided for the main toolslide. Upper and lower rear slides, holding the tools for the fourth, fifth, sixth, and seventh stations, are fed 0.0019 inch per revolution. Tools for the second and third station, held on the

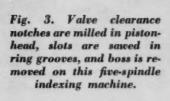
lower front slide, are fed at a decelerated rate from 0.0157 to 0.0052 inch per revolution.

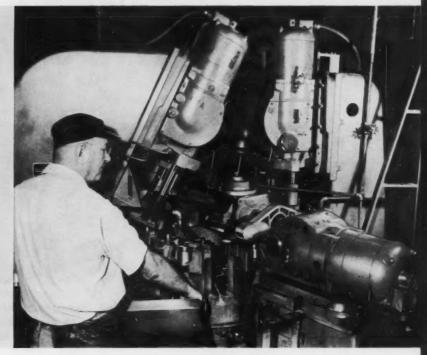
Two angular valve clearance notches are milled in the head end face of each piston, two 5/64-inch thick slots are sawed in the lower ring groove, and the center boss is milled from the head end of the piston on the Kingsbury fivespindle, six-station, semi-automatic indexing machine shown in Fig. 3. Vertical angular heads

Fig. 2. Operations performed at various stations of eightwork is illustrated at second station. The piston









are provided at the first and third stations for butt-milling the clearance notches. Saws, 6 inches in diameter by 5/64 inch thick and having forty-four teeth, are mounted on horizontal heads at the second and fifth stations. The butt-mill for removing the center boss is on a vertical head at the fourth station, and loading and unloading of the pistons are performed at the sixth station of the machine.

Pistons are automatically milled to a weight of 464 grams, plus or minus 2 grams, on Morris automatic piston balancing machines, such as the one seen in Fig. 4. The chute from which the pistons are automatically loaded into the machine passes over an Exact Weight Shadowgraph scale which was installed to automatically reject overweight and underweight pistons that could not be balanced in the set-up. It was found,

spindle chucking machine seen in Fig. 1. Method of clamping skirt is elliptically turned at the eighth station.

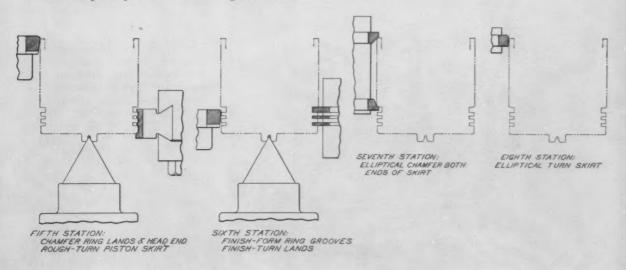




Fig. 4. Automatic piston balancing machine which brings pistons within required weight limits by milling material from the cast weight bosses.

however, that this scale was unnecessary and has been disconnected because of the close tolerances maintained in permanent mold casting and previous machining of the pistons.

As each piston reaches the pan on the second scale (seen at the lower center in Fig. 4), its weight is recorded by the position of the scale beam and the depth of cut to be made by the milling cutter is automatically determined and preset. The piston is raised to the cutting position by a transfer arm and clamped by a spring collet. The milling cutter is fed from below to re-

move the required amount of metal from the balance weight bosses cast in the piston bore. Balanced pistons are automatically discharged onto the unloading conveyor seen at the lower right.

Piston skirts are finish-turned to the required elliptical size, and the wrist-pin holes are semi-finish- and finish-bored on specially equipped Heald three-way Bore-Matics. The machines are provided with three-position indexing units, with each position having two piston-holding fixtures, as seen in Fig. 5. Pistons are manually loaded into the fixtures, two at a time, locating



Fig. 5. Special three-way precision boring machine for finish-boring wrist-pin holes and finish elliptical turning the piston skirts, two at a time.

from the top land on the periphery of each piston and clamping against the head face. Prior to clamping, hydraulically actuated pins are introduced into the rough-bored wrist-pin holes to insure radial location, and these pins are retracted after clamping and prior to indexing.

When the pistons have been indexed to the lower position (seen at the bottom in Fig. 5), boring-bars-one at each end of the machineare hydraulically fed toward each other to machine the wrist-pin holes. Each bar carries a carbide-tipped tool for semi-finish-boring and a diamond tool for finish-boring both wrist-pin holes in each piston. About 0.010 inch of stock is removed from each side by both tools, holding the wrist-pin bore between 0.8593 and 0.8596 inch in diameter-a total tolerance of only 0.0003 inch-and producing a surface finish within 50 micro-inches r.m.s. Rapid traverse of the boring-bars is provided between the wristpin holes, and bar rotation is stopped for retraction.

Elliptical turning is performed at the third position of the indexing unit, with the pistons facing the rear of the machine. Two rotating, box turning tool-holders, set at an angle with relation to the piston axis and hydraulically fed on a slide parallel to the axis, are provided for this operation. Each head carries a carbide tool for semi-finish-turning and—diametrically opposite but trailing the carbide tool—a diamond tool for finish-turning the piston skirt. About 0.015

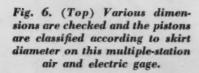


Fig. 7. (Right) Progressive line of four centerless grinding machines which remove approximately 0.012 inch of stock from the diameters of piston-pins.





MACHINERY, November, 1954-175



Fig. 8. Two aluminumoxide abrasive belts remove feather edges from the ends of the piston-pins as they leave the fourth centerless grinding machine.

inch of stock is removed from each piston skirt by both tools.

Although a total tolerance of 0.0025 inch is permitted on the piston skirt diameter (with the minor axis 0.014 to 0.016 inch less than the major axis), the pistons are subsequently classified by skirt size in 0.00025-inch increments. Also, surface finish must be maintained within a maximum of 60 micro-inches r.m.s., and the skirt and the pin-holes have to be held square with the ring grooves within 0.0005 inch per inch.

In addition to eliminating the need for cam grinding the piston skirt, the smooth surface finish produced and close accuracy maintained in machining the wrist-pin holes have made a previously required burnishing operation unnecessary. Production obtained from each of these precision boring and turning machines is 240 pistons per hour.

After removing all burrs, feather edges, and nicks, and washing with hot water and drying with air blasts, the pistons are tin-plated. The automatic cleaning, plating, and washing machine seen in the heading illustration is employed for this operation. When the pistons have been loaded on the plating racks (each rack holding 32 pistons), they are automatically cleaned, rinsed with water, immersed in a dilute solution of nitric acid (containing 3 to 4 per cent by volume of nitric acid), and again rinsed with water. Next the pistons are immersed in a

sodium stannate solution containing 2 to 4 ounces of tin per gallon and having a maximum free alkali content of 0.20 ounce per gallon. This bath is kept at a temperature between 170 and 180 degrees F., and maintained by periodic additions of acetic acid. The pistons remain immersed in this solution for about four minutes, providing a tin-plating approximately 0.00004 inch thick. They are then successively rinsed in cold and hot water.

Plated pistons are unloaded and placed on gravity roll conveyors leading to an inspection room having conditioned air maintained at a temperature of 70 degrees F. Here, Pratt & Whitney multiple-station, combination Electrolimit and Air-O-Limit machines, Fig. 6, are employed to inspect and classify the pistons. The automatic cycle includes inspection of the diameter of the piston skirt at a point just below the third ring groove, the width and diameters of the ring grooves, the diameter of the top land, and wrist-pin hole diameters.

The electrical system of the machine automatically determines which one of the ten classification sizes applies, and the letter signifying the class is indicated by dial and light, and is printed on the piston head. As previously mentioned, classifications are based on the piston skirt diameters, and each class varies from the next by only 0.00025 inch in diameter. Inspecting and classifying the pistons are completed at the rate of more than 500 per hour.

Piston-pins are produced from fine-grain, machine steel bar stock, 0.875 inch in diameter. The pins are drilled, reamed, chamfered, and cut to length on Conomatic six-spindle automatic bar machines. After centerless grinding to reduce the diameters to between 0.871 and 0.872 inch, the pins are carburized and quenched. Both ends of the pins are ground on a Besly double-spindle disc grinder.

Peripheries of the piston-pins are then reduced to a diameter between 0.8596 and 0.8597 inch by passing them through a progressive line-up of one No. 3 and three No. 2 Cincinnati centerless grinding machines, Fig. 7. Pins are placed in a loading elevator and dumped into a Cincinnati Feedmatic hopper located in front of the first machine. Approximately 0.007 inch of stock is removed from the piston diameters in the first grinder, 0.003 inch in the second machine, 0.0015 inch in the third, and 0.0004 inch in the final centerless grinding machine.

Vitrified-bonded, aluminum-oxide wheels of 60 grain size and medium grade and struc-

ture are employed on the first two centerless grinding machines. Similar wheels of 220 grain size are employed on the last two machines. Hydraulic diamond dressing attachments, Citco diamond turners, tungsten-carbide work blades, Barnesdril magnetic coolant separators, and Airtemp water coolers are provided for the centerless grinders. As the pins leave the last machine, they pass beneath two aluminum-oxide abrasive belts, Fig. 8, to remove feather edges from their ends.

A surface finish of 4 micro-inches r.m.s. is imparted to the piston-pins, and their diameters are reduced to between 0.8591 and 0.8593 inch by lapping on Norton Hydrolap machines, such as the one seen in Fig. 9. Pins are lapped forty at a time by placing them on the radial spokes of a special fixture, Fig. 10. In the first lapping operation, approximately 0.00025 inch of stock is removed from the pin diameters with a 100 grit abrasive wheel. A 400 grit abrasive wheel is used to remove the last 0.00015 inch of stock in the final lapping operation.

Fig. 9. Approximately 0.0004 inch of stock is removed from the peripheries of piston-pins in two operations on lapping machines.

Fig. 10. Special fixtures having fingers extending radially from their peripheries hold forty piston-pins for the lapping operations.





Assembly Machines Speed Output of Automotive Accessories

By HOWARD L. ROAT

Master Mechanic

AC Spark Plug Division

General Motors Corporation

Flint, Mich.



Increased production of improved quality automotive accessories is being obtained by means of semi-automatic assembly machines. Machines employed at AC Spark Plug for assembling radiator pressure caps, gasoline indicator gage coils, temperature gages, and ammeter frames are here described

ONTINUED demands for increased production of automotive accessories manufactured by the AC Spark Plug Division of General Motors Corporation has made it mandatory to employ automatic machinery wherever possible. Also, semi-automatic assembly machines have been developed to speed the output of spark plugs, gasoline gages, radiator pressure caps, temperature gages, speedometers, ammeters, and other instruments and accessories. A few of the most interesting assembly machines used at the Flint, Mich., plants of AC Spark Plug will be described in this article.

Radiator Pressure Caps Assembled at Rate of 1250 per Hour

A semi-automatic machine employed to assemble automotive radiator pressure caps is seen in Fig. 1. This machine, designed by the General Motors Process Development Section, is capable of assembling 1250 caps per hour.

Covers for the radiator pressure caps are automatically fed from a hopper at the left of the machine. Fig. 2, onto an indexing carrier. Here, an operator manually assembles a washer and main spring to each cap. Then, a brass main valve plate, fed from the hopper seen in Fig. 3, is automatically assembled to each cap. A second operator places a vacuum release valve on each assembly, and the valve is secured by staking rivets in the press at the right of the operator.

After the radiator pressure caps have been indexed from the staking press position, they are automatically inspected. This inspection covers a spring pressure range of 4 to 13 pounds depending upon requirements. Unsatisfactory assemblies are automatically ejected into a container below the conveyor. The machine can easily be converted to the production of any of five different model caps.

Bulb and capillary assemblies for water temperature indicating gages are being assembled, soldered, and tested on the special, twenty-fourstation rotary machine seen in Fig. 4. The capillary wire (on which a soft solder ring has been previously assembled) and the bulb are manually loaded into a fixture by the operator at the left. When the loaded fixture has passed the operator, flux is sprayed on the solder ring and connecting socket.

Oxy-acetylene flames are directed on the fluxed solder rings from torch heads, which travel with the fixtures for approximately one-eighth of a revolution. Simultaneously, air cylinders are automatically clamped on the ends of the bulbs, and they are subjected to a pressure of 250 pounds per square inch. As the soldered assemblies continue their rotation about the center of the machine, they are immersed in a water tank.

An inspector watches the surface of the water for bubbles, indicating a leaking assembly. Assemblies that do not leak are marked with paint as they emerge from the water and, after passing through a hot-air dryer, are removed from the machine by an unloading operator. Unpainted parts that have leaked are left on the machine and go through the same soldering process. With this set-up, two operators and one inspector can complete 870 assemblies per hour.

Sixteen-Station Rotary Machine for Winding Electrical Coils

Electrical coils for gasoline indicator gages are wound at the rate of twenty-seven per minute on a special sixteen-station, rotary machine seen in the heading illustration, with only two operators and two inspectors. To attain this same production previously, eight operators were required on hand machines. The special machine has a round, continuously rotating table carrying sixteen individually replaceable winding heads. A variable-speed drive is provided for timing table rotation to suit the operators.

Empty coil bobbins are manually loaded into automatically opened split collets as they pass the loading operator. Two bobbins are carried on each of the sixteen two-station fixtures. As the fixtures reach the position shown in Fig. 5, they are indexed 180 degrees by means of a spring-loaded pivoting cam and dog arrange-

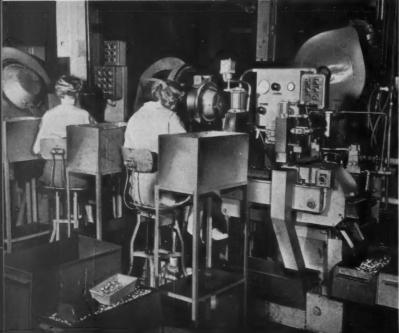


Fig. 1. (Left) Radiator pressure caps are assembled and tested at rate of 1250 per hour on this semi-automatic machine which requires only two operators.

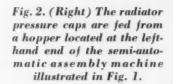
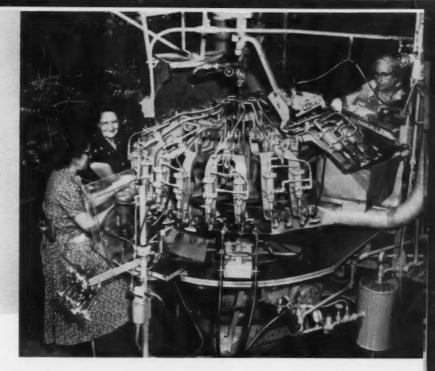






Fig. 3. (Left) Second operator on radiator pressure cap assembly machine places a vacuum release valve on each assembly. The valve is secured by rivets.

Fig. 4. Special twenty-fourstation rotary machine for assembling, soldering, and testing bulb and capillary assemblies for water temperature gages



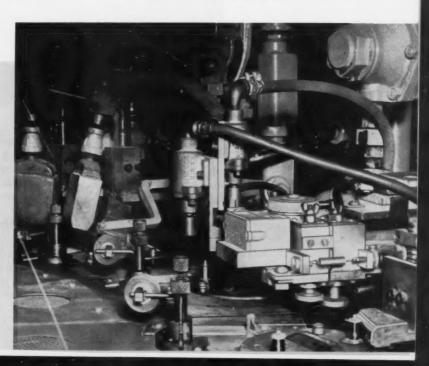
ment. This indexing forms a half-wrap around the empty bobbin with No. 33 (0.005 inch diameter) copper wire supplied from a pay-off stand above the fixture. The nylon insulation on the wire for this initial half-wrap is burned off by gas flames.

A 1-inch diameter resistance welding wheel, Fig. 6, joins the bare end of the wire to the core of the bobbin. After welding, a cam-operated micro switch starts the 1/20-H. P. synchronous motor on the winding head, rotating the bobbin at 1800 R.P.M. That portion of the wire stretched between the empty and full bobbins on each fixture will break instantly. Adjustable timers, provided on each head, automatically control number of wraps made on the bobbins.

A wire guide reciprocates up and down to insure level winding over the length of the spool. Synthetic rubber adhesive is wiped on each completely wound coil to prevent unravelling by a continuously rotating gluing fixture. When each bobbin-holding fixture returns to the loading position, the collet holding the completed coil is automatically opened, and the part is automatically ejected by means of an air blast.

The operator reloads the open collet with an empty coil bobbin. A second operator, stationed on the opposite side of the machine, rethreads the wires when they break, keeps the gluing fixture filled with adhesive, and replaces wire supply spools when they become empty. The unit construction of the pie-shaped, individual wind-

Fig. 5. Fixtures holding two coil bobbins are automatically indexed 180 degrees to form a half-wrap of copper wire around the empty bobbin at this station.



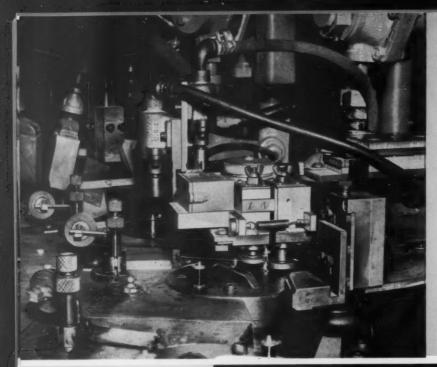
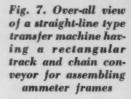


Fig. 6. (Left) Nylon insulation is burned from end of 0.005-inch diameter copper wire, and wire is resistance welded to core of empty coil bobbin.





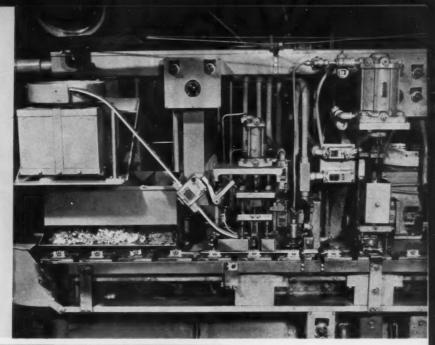
ing heads permits quick replacement for repairs with a minimum of machine "down" time.

Transfer Machine for Assembling Ammeter Frames at Rate of 1200 per Hour

Ammeter frames are assembled on a straightline type, transfer machine, Fig. 7, having a 6-foot wide rectangular track. Fiber ammeter frame insulators, having locating holes which fit over pins on the carrier fixtures, are automatically loaded—one on each fixture—from a Syntron hopper. As the fixtures are carried along the track by a chain conveyor, an operator loads a brass frame on locating pin on each fixture.

Magnets are automatically fed onto the assemblies from a second vibrating hopper, Fig. 8. A micro switch on the machine track checks each assembly and, if a magnet has not been properly positioned on each fixture, the machine is automatically stopped. Ears previously formed on the ammeter frames are bent over to stake the magnets in place by the punch of an air press mounted over the machine track. An anvil in the

Fig. 8. (Right) Ammeter magnets are automatically fed onto carrier fixtures from a hopper, and ears on the frames are bent over to stake the magnets.



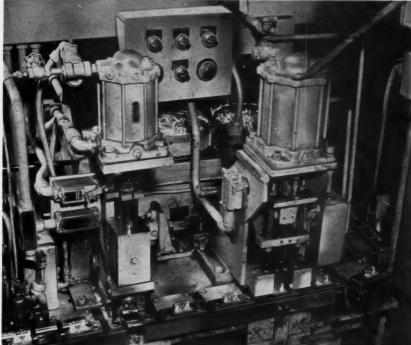


Fig. 9. Two studs, automatically fed from hoppers seen at rear center, are pressed into each ammeter frame by air-operated press at right.

base of the press supports the assembly during staking.

Hopper feeds are also provided to load two studs in each ammeter frame assembly, Fig. 9. The studs have been knurled under their heads, and are press fit into the assemblies. As the studs enter the holes in the ammeter frame parts, locating pins on the carrier fixtures are automatically retracted. Another air-operated press, this one located at the rear of the machine, is equipped with punches to pierce two holes in each ammeter frame. An anvil is also provided

in the base of this press for supporting the assembly during piercing.

As the chain conveyor continues to carry the fixtures along the track, air-actuated pins are raised automatically to contact the studs and lift the assemblies from the fixtures. Blasts of air eject the frames from the machine. Insulators are again fed onto the empty fixtures, and the continuous cycle is repeated. With this set-up, one operator can assemble 1200 ammeter frames per hour. Previously, four operators were required for the same production.



Rearrance Axxes housings, axle shafts, differentials, front suspension arms, and a number of other chassis parts for Ford, Mercury, and Lincoln automobiles are manufactured in high volume at the Mound Road plant of the Ford Motor Co. Some of the improved methods that have been developed to increase the production, lower the manufacturing costs, and maintain the high quality required on these parts will be described in this article.

Front suspension arms for the automobiles are stamped from hot-rolled, low-carbon, oil-hard-ened steel plates 0.180 inch thick. Considerable difficulty was previously experienced in cold-forming and extruding bushing holes in these heavy stampings because of the short punch life as well as the amount of scrap resulting from this operation.

Punches for forming and extruding the bushing holes were made from molybdenum high-speed tool steel containing about 0.80 per cent carbon, 0.30 per cent manganese, 0.30 per cent silicon, 4.00 per cent chromium, 1.15 per cent vanadium, 1.50 per cent tungsten, and 8.50 per cent molybdenum. The punches were hardened,

ground, honed, and nitrided to produce a hardness of 60 to 62 Rockwell C. They then were liquid honed to produce a surface finish of 2 to 3 micro-inches r.m.s., hard chromium-plated to a thickness between 0.0017 and 0.002 inch, and again liquid honed before use. The hard chromium-plated punches had a life varying from 5000 to 15,000 suspension arms.

Also, a battery of six machines was necessary to drill, ream, and spot-face the holes in order to correct their size or alignment, and improve the surface finish. Now, scrap losses have practically been eliminated, and the need for machining removed, by employing punch tips made from a tough, highly shock resistant grade of tungsten carbide (Carboloy Grade 55A).

After forming and extruding as many as 150,000 suspension arms, the diameter of the carbide punch was reduced only 0.0003 inch by wear. Scoring has been completely eliminated, and a mirrorlike surface finish is being produced in the bushing holes.

Forming and extruding of the bushing hole in each end of the lower rear, front suspension arm are performed on a Hamilton 400-ton press,

Ford's New Method of Forming and Machining Chassis Parts

By CHARLES H. WICK
Associate Editor

Carbide punches for extruding bushing holes in front suspension arms, automatic burnishing and assembly of universal joint flanges, transfer machining of differential carriers, and induction hardening on automatic bar machines are among the improved methods employed in producing chassis parts at Ford

Fig. 1, having a 12-inch stroke and a bed 48 inches from right to left and 36 inches from front to back. Starting holes in the suspension arms are previously pierced to a diameter of 1/2 inch, and then cut with a 9/16-inch diameter drill to remove any work hardening caused by piercing. The nose of the carbide punch tapers at an angle of 45 degrees, and provides an initial clearance of 1/16 inch per side in the starting hole.

A cross-sectional view of one of the bushing-hole extrusion dies is seen in Fig. 2, with part of the lower rear, front suspension arm indicated at A. An internally threaded bushing B, made from SAE 4340 steel, is pressed into the bore of the carbide punch tip C, and secured by a socket-head cap-screw D that passes through the bore of punch shank E. The present shanks were made by grinding down the previously used high-speed steel punches, but new shanks will be made from a high-alloy tool steel.

The punch is retained by a screw-actuated pin F that engages a groove ground in the punch shank periphery, and backed up by a plate G in lower shoe H. An air cushion in the bed of the press is employed to strip the formed and ex-

truded suspension arm from the punch, and spring-loaded stripper J prevents the part from adhering to forming die K as the press ram rises. The only difficulty experienced thus far has been occasional stripping of insert B from the bore of carbide tip C. To correct this, the tip and shank are being silver-soldered, and other remedies are under consideration.

Automatic Machining, Burnishing, and Assembling Machine

Finish-machining and burnishing the oil-seal surfaces and assembling dust shields on universal joint flanges previously required the use of three grinding machines and an assembly press. Now, all of these operations are performed automatically on the Rehnberg-Jacobson five-station, rotary indexing machine seen in the heading illustration and Fig. 3. Each station on the rotary indexing table has two work-holding fixtures for handling two parts at a time. Indexing requires only 2.20 seconds, and the maximum machining and assembling time, 9.80 seconds. The result is a production of 480 parts per hour at normal efficiency.

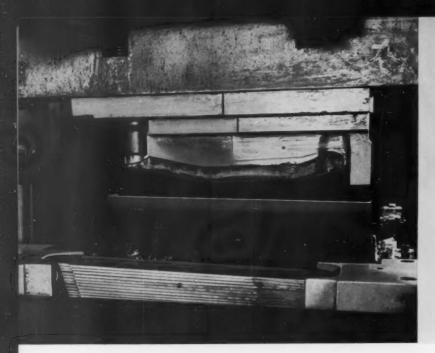


Fig. 1. Front suspension arm stamping is about to be ejected from punch in this view. Blanks are loaded into the 400-ton press from a magazine.

Universal joint flanges, forged from SAE 1138 steel, are loaded on the fixture arbors, two at a time, locating from the hub end face and splines previously machined in the bores of the parts. A two-spindle head at the second station carries hollow mill cutters—each cutter containing three tungsten-carbide tipped, inserted blades. These tools, rotating at 468 R.P.M. to provide a cutting speed of 200 surface feet per minute, are fed at the rate of 0.0171 inch per revolution. One tool finish-turns the oil-seal surface to a diameter between 1.626 and 1.628

inches, another forms a 0.12-inch radius on the outer corner, and the third faces the end of the flange hub to provide an over-all length of 2.400 inches.

Collapsing type Cogsdill "Bearing-izer" tools having vertically positioned carbide rolls are provided on the two spindles at the third station of the machine to burnish the peripheries of the hubs. In this operation, the tools are rotated at 940 R.P.M., providing a surface speed of 400 feet per minute.

When the universal joint flanges have been

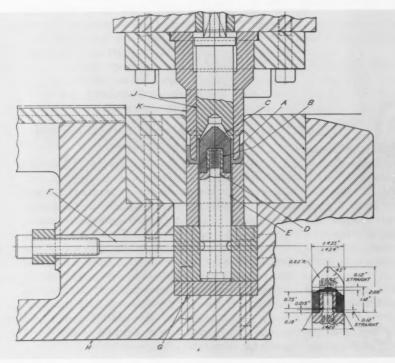
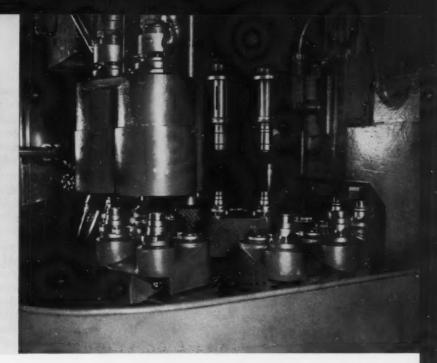


Fig. 2. Drawing of one of the bushing hole extrusion dies employed on the press seen in Fig. 1. Carbide punch tip is seen at (C).

Fig. 3. Close-up view of the tooling area on the fivestation, rotary indexing machine shown in the heading illustration. Dust shields are hopper fed.



indexed to the fourth station, the end faces on the hubs of both parts are burnished with flat surface "Bearing-izer" tools. Each tool contains fourteen radially positioned carbide rolls, 0.1245 inch in diameter by 0.250 inch long, which are pressed against the end face as the tool rotates at 1400 R.P.M., providing a surface speed of 600 feet per minute. This operation removes tool marks and smooths the surfaces, making them suitable for the application of leather seals at assembly.

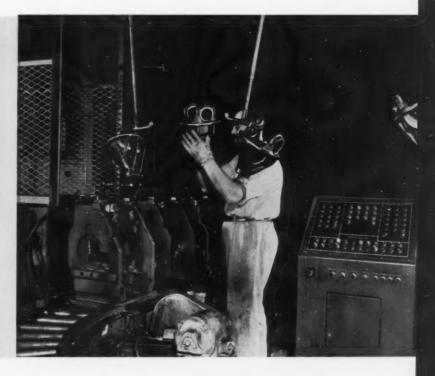
A dust shield is pressed on each universal

joint flange hub at the fifth station. The dust shields are hopper fed into position and pressed on by spindle adapters. When the spindles rise, the two flange assemblies are manually unloaded and placed on a washer conveyor.

Transfer Machining of Rear-Axle Differential Carriers

Rear-axle differential carrier assemblies are completely machined, except for a subsequent finish-boring operation, on the Greenlee nine-

Fig. 4. Rear-axle differential carrier assemblies are completely machined, except for finish-boring, on this nine-station machine.



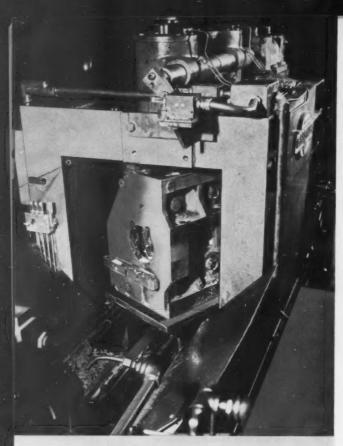


Fig. 5. Fifth station of the automatic transfer machine seen in Fig. 4 is provided with a hydraulically actuated device for rotating fixtures 90 degrees.

station automatic transfer machine shown in Fig. 4. Before, these operations required the use of a battery of machines. The work-pieces are now transferred through the Greenlee machine two at a time, and a production of 198 parts per hour is obtained.

Carrier assemblies are loaded on pallet type fixtures, locating on their flange faces and two previously machined dowel holes. A Century four-spindle, hydraulic nut-runner is employed to secure the assemblies to the fixtures. The two loaded fixtures are positioned for transfer into the machine at the first station. Transfer of the fixtures through the machine is accomplished with a hydraulically actuated bar. At every station, two bullet-nosed dowels (four per station) come up through each fixture for location; then the fixtures are hydraulically clamped.

At the second station, tools on the right-hand head bore two clearance holes, rough-bore one pinion bearing hole, and face the end of the housing. A left-hand head at the same station carries tools to bore another clearance hole and a second pinion bearing hole. A right-hand head only is located at the third station for spot-facing ten bosses on each work-piece. Station 4 has both a left- and right-hand head for semi-finish-boring and chamfering both pinion bearing holes and an oil-seal hole.

The fixtures are automatically rotated through an angle of 90 degrees at the fifth station, Fig. 5, to position the differential carrier assemblies for subsequent cross-boring. Two cross-holes in each



Fig. 6. Loading position of six-station, horizontal scanning type machine for induction hardening of axle shafts from their splined ends to the flange fillets

part are rough-bored and chamfered, and a third hole is drilled in preparation for subsequent tapping, at the sixth station. The two cross-holes are semi-finish-bored, and two more holes to be tapped are finish-bored at the seventh station. At the next station, two holes in the right-hand side of each assembly and four holes in the left-hand side are tapped. Four of the six holes have $3\ 1/16-16$ threads.

The loaded fixtures are automatically ejected into the ninth station, where the two carrier assemblies are unloaded and hung on a conveyor leading to the finish-boring machines. Empty fixtures are carried on a chain slat type conveyor through a three-stage washer (hot-water wash, hot-water rinse, and air blow-off) that parallels the transfer machine, and back to the loading station.

All tools on the transfer machine are of the inserted-carbide blade type with the exception of the chasers, taps, and drills. The machining cycle time is based on semi-finish-boring the 2.844 inch-diameter, pinion bearing hole at the fourth station. This operation is performed with the tools rotating at 268 R.P.M. (200 surface feet per minute), and fed at the rate of 0.017 inch per revolution (4 1/2 inches per minute). The carbide blades for this operation have produced 100,000 parts. Thread chasers and taps employed at the eighth station are changed every sixteen hours, but from experience it has been found that these tools require only a minimum of sharpening.

Induction Hardening of Axle Shafts

Axle shafts, forged from SAE 1038 steel, have a tapered shaft approximately 28 inches long, with a mean diameter of 1 inch. As received for machining, the shafts have a Brinell hardness of 179. After machining, the shafts are induction heated on Westinghouse horizontal scanning type, six-station, induction hardening machines, such as the one seen in Fig. 6. The machines receive power from motor-generator sets of 3000cycle, 200-K. W. capacity, each set providing an output of 100 K. W. per station or shaft. Surface hardness produced in this operation varies from 52 to 55 Rockwell C on the splines near the end of the shaft, to 48 to 52 Rockwell C near the middle of the shaft. Depth of the hardened zone, which has a martensitic structure, varies from 0.100 to 0.130 inch, with a hardness of 40 Rockwell C at maximum depth.

Axle shafts are manually loaded into the fixtures, the flanged ends of the shafts being positioned in the fixtures and the shaft ends supported by high-speed steel centers. With the shafts fed all the way into the machine by rapid traverse, 540-volt current is applied to the heating coils for 3.5 seconds. Then the current is turned off for 1.5 seconds before full voltage (680 volts) is applied and scanning begun. During scanning Fig. 7, the shafts are fed through the coils at the rate of 0.7 inch per second. The entire shaft length, from spline end to flange fillet, is heated at this rate, and then quenched

Fig. 7. During scanning, the axle shafts are fed through the induction heating coils at a rate of 0.7 inch per second. Six shafts are hardened at once.



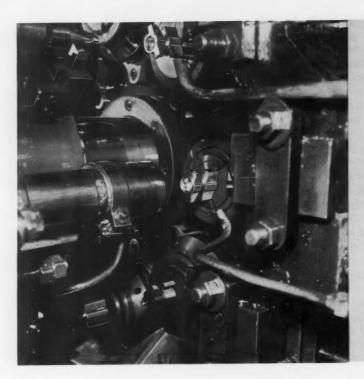


Fig. 8. At the seventh position of an eight-spindle automatic bar machine, bearing raceways are induction hardened to 59 to 64 Rockwell C.

by passing through a ring containing seventytwo holes, 0.075 inch in diameter, through which water under a pressure of 3 to 4 pounds per square inch and at a temperature of 80 degrees F. is sprayed. This water, which does not contain additives, is recirculated. Vaporization losses amount to about 10 per cent per day.

This method of selective surface hardening eliminates the need for fixtures to mask the flanged portion of the axle shaft that is to remain soft, minimizes distortion, and permits heattreating directly in the production line. A major advantage of the scanning method of induction heating is that a relatively small power input is required, compared with that necessary to heat the entire surface all at once.

Another interesting application of induction heating, which has been in successful use for several years at the Mound Road plant, is the hardening of raceways in universal joint flanged bearings on automatic bar machines. The flanged bearings are made from a modified S A E 1144 steel containing 0.49 to 0.55 per cent carbon, supplied in the form of extruded bar stock.

A 2 5/8-inch capacity, eight-spindle Conomatic is employed to machine the bearings from bar stock and harden the raceways. The stock is successively drilled and rough-butt-faced at the first position; formed, drilled, rough-counterbored, and chamfered at the second position; bored, under-cut, chamfered, and formed at the third position; reamed and formed at the fourth position; burnished at the fifth position; and faced, reamed, counterbored, chamfered, finish-faced, and finish-formed at the sixth position.

When the universal joint flanged bearing has

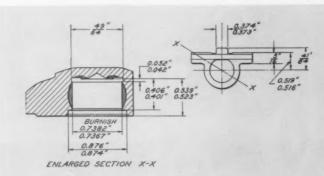
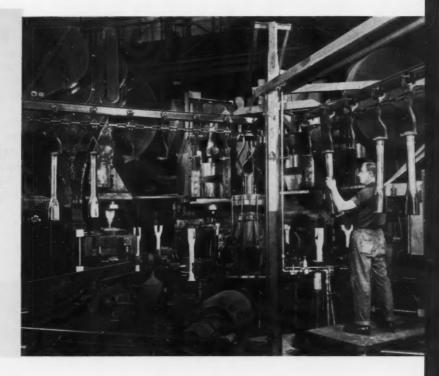


Fig. 9. Dark areas, indicated in the cross-sectional view of this universal joint flanged bearing drawing, show the hardness pattern obtained by induction heating the part.

Fig. 10. Automatic merrygo-round fixture carries rear-axle housing "banjo" halves to five presses, and loads and unloads presses.



been indexed to the seventh position, Fig. 8, an internally water cooled, three-loop copper coil, wound on a Lucite mandrel, enters the bore of the bearing. A 460-volt current, supplied by a Tocco 20-K. W., 450,000-cycle vacuum tube oscillating generator unit, is applied to the coil for forty-six seconds. It is interesting to note that the heating cycle is not long enough to melt the Lucite mandrel. After mineral oil quenching, the bearing raceways have a hardness of 59 to 64 Rockwell C to a depth of 0.050 inch, with a minimum depth of 0.025 inch at the extremities. In Fig. 9, which is a drawing of the flanged bearing, the dark areas indicate the hardness pattern. The bearings are cut off from the bar stock at the eighth position, and a production of 146 parts per hour is obtained. One universal joint flange bearing from every two hours' production on the automatic bar machine is cut apart and etched to check the hardness pattern.

Automation on Presses

A good example of the application of automation to punch presses is illustrated in Fig. 10. Here a series of five presses, arranged in a semicircle, are employed to form half of the rear-axle housing "banjo" from an upset tube. Successive operations performed on the tubes are: first forming the banjo end; restriking; final forming; trimming the banjo ends; trimming the banjo radius; and notching both sides.

One man attends all five of the presses by loading the upset tubes on the arms of an eight-station, automatic hydraulically operated turret, located at the hub formed by the presses. This turret fixture carries the tubes from one press to another, and loads and unloads each press. Unloading to a conveyor is automatic. In addition to the improvement in operating costs, the present set-up is much safer.

Powdered Metal Parts Find Increasing Automotive Applications

By D. B. MARTIN
Vice-President
Amplex Division
Chrysler Corporation
Detroit, Mich.

Automotive applications of powdered metal parts have grown from 50 to 100 for each car in less than ten years because purer, more uniform materials are available at lower cost. Also, closer control of the processing, better techniques, and more powerful presses have made it possible to produce denser parts having improved physical properties



HILE powder metallurgy was used in ancient times for making tools and weapons, modern applications were not developed until the middle of the nineteenth century. The process was revived early in the twentieth century as a means of making selflubricating bearings. However, brittleness, insufficient strength, and noisy operation made the use of such parts unsatisfactory-particularly for automotive applications.

One trouble that plagued early automotive engineers was in the clutch-pilot bearing. Located in the crankshaft flange, this bearing was inaccessible after assembly. When the bearing failed or became noisy due to the lack of adequate lubrication, the only solution was expensive disassembly and replacement. In the late 1920's, Chrysler engineers succeeded in licking this problem by developing Oilite Bronze for a heavyduty, self-lubricating bearing. The Amplex Division of Chrysler Corporation was formed to produce this bearing, as well as other products, and conduct extensive research to develop additional applications of powder metallurgy.

Oil-cushion bearings made from powdered metal were found to be strong and quiet. They permitted smaller bearing clearances, and soon replaced many cast bronze and rolled bronze bearings, as well as hardened steel and some anti-friction bearings. One early application was the use of Oilite Bronze bearings for automotive water pumps. Over 20,000,000 bearings of this

one type have been produced.

With the development of additional materials and parts other than bearings, the growth of powdered metal applications has been tremendous. Just in the past ten years, the number of powdered metal parts used in each automobile made by Chrysler has increased from about 50 to more than 100. Amplex today makes over 22,000 bearings of different sizes, in addition to 10,000 structural parts and machine components. The amount of powdered iron being used by the entire industry is about eight times the quantity used in 1946.

Principal reasons for the growth of the powder metallurgy industry have been an extensive research and development program and the availability of purer, more uniform powdered materials at lower cost. Also, closer control of processing, improved manufacturing techniques, and more powerful presses have made it possible to produce denser parts having improved physical properties. Size of the parts, which was once a limiting factor, is no longer an important consideration. Parts so small that 10,000 weigh only 1 pound, and others up to 20 inches in diameter, weighing 250 pounds each, have been produced.

An important advantage of the process is that many improved quality products can be produced. Parts can be made to exact dimensions within close tolerances by molding the powders in accurate dies and controlling the shape of the compacts during heat-treatment. Complicated shapes are possible without any, or a minimum of, time-consuming, expensive machining, and scrap losses are practically eliminated. The process is the most practical and economical method of producing many parts having splines, gear teeth, eccentric bores, and holes or depressions of square, hexagonal, rectangular, or other shape. Tooling-up can be done quickly and at relatively low cost, and product design possibilities are broadened.

Developments in Powdered **Metal Materials**

Oilite Bronze, the original self-lubricating bearing material developed by Amplex, is essentially a phosphor-bronze containing approximately 90 per cent copper and 10 per cent tin. This heavy-duty, high-ductility material, containing approximately 25 per cent oil by volume, is produced in a wide range of sizes in plain, flange, thrust, and self-aligning bearings; cored, bar, and plate stock; and finished machine parts.

Super-Oilite and Super-Oilite 16 are also selflubricating iron-base materials composed of powdered iron and copper, the former developed for high-pressure and the latter for extremepressure applications, particularly at low velocities. Iron Oilite is a copper-free, pure iron selflubricating material that is resistant to many chemical and corrosive actions, particularly of sulphur and its compounds. Oilite Silver is a copper-base, nickel-zinc alloy that is also highly resistant to corrosion.

Among the newest developments in powdered materials is Oilite Stainless Steel, a Type 302 iron-base alloy containing 18 per cent chromium and 8 per cent nickel. Type 316 is also frequently used and others have been developed. More uniform powder has been the key to successful production of stainless-steel parts by this method. Conventional briquetting and sintering techniques are employed, with the exception of greater pressures (approximately 50 per cent higher) and higher temperatures, followed by cold sizing. Success of this method has resulted in savings up to 75 per cent over previously machined stainless-steel parts.

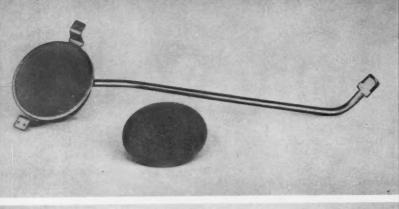


Fig. 1. Self-cleaning, permanent gasoline tank filter installed as standard equipment on all Chrysler-built automobiles and trucks. The molded bronze filtering disc is produced from powder.



Fig. 2. Bushings at left and right, pressed from stainlesssteel powder, are used in exhaust manifold butterfly valves. Automobile window regulator gears are produced from new Steel Oilite.

Another important advance, developed within the past year, has been "Steel" Oilite. This material is a very pure electrolytic iron that is specially processed and pressed under high pressure to give greater density. In this way, tensile strengths of 35,000 to 120,000 pounds per square inch—comparable to those of low-carbon steels are obtained. Also, a ductility of 1 to 10 per cent in 2 inches—up to three times that of other iron powder products—is produced. The material can be hardened to 60 Rockwell C by carburizing, cyaniding, nitriding, or other processes, with some sacrifice in ductility; or carbon or alloy powders can be added to increase its strength. During sintering, pores of the iron can be infiltrated with copper to increase the strength.

Other developments in non-automotive fields include Aluminum Oilite for weight-saving applications, and Tungsten Oilite for heavyweight, limited volume uses. Tungsten Oilite is a mixture of tungsten and iron, or tungsten and copper powders, giving a product two and one-half times the weight of a bronze part of the same volume. One application of this heavyweight, low-volume material is in flywheel balancing in instruments.

Recent Automotive Applications

An interesting and unusual application of powder metallurgy in the automotive field is the self-cleaning, permanent gasoline tank filter, Fig. 1, installed as standard equipment on all cars and trucks built by the Chrysler Corporation. The filter consists of a bronze disc, molded from spherical powder grains, mounted in a

sheet-metal housing. Porosity is accurately controlled during molding, and the discs are then tin-plated. The tin, with the bronze acting as a catalyst, prevents gumming in contact with the gasoline.

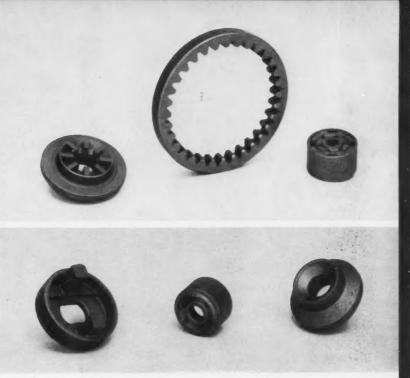
Because of its inaccessibility inside the gasoline tank, the filter is designed to give 200 times the flow needed during initial operation to assure lifelong service. However, the sloshing action of the gasoline keeps the filter clean. Moisture, oil, or foreign particles are prevented from entering the fuel line, and the filter resists clogging by ice crystals, dirt, or gummy substances. Filters are also made from brass, copper, iron, stainless steel, and nickel silver for applications, other than automotive, in metering, diffusing, separating, and sound deadening.

An application of stainless-steel powdered metal for automobile engines is illustrated by the bushings seen at the left and right in Fig. 2. These bushings are used in the butterfly valves in exhaust manifolds. Stainless steel was specified because of the high temperatures and corrosive action to which the bushings are subjected by the exhaust gases. These powdered metal parts represent a substantial saving over those previously machined from stainless-steel bar stock.

Automotive applications of the new Steel Oilite material include the window regulator gears shown at the center in Fig. 2, and slides for hydraulic power steering units. Production parts pressed from a mixture of 79 per cent copper and 21 per cent iron powders include the pistonrod guide for an Oriflow shock absorber, the oil-

Fig. 3. Shock absorber pistonrod guide (left), torque converter oil pump gear (center), and shock absorber piston (right) are all made from a mixture of copper and iron powders.

Fig. 4. Parts produced from a mixture of 7 per cent copper and 93 per cent iron powders include (left to right) hydraulic power steering coupling, shock absorber piston, and piston-rod guide.



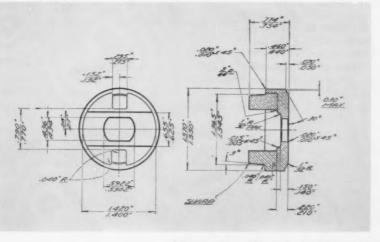
pump gear for the PowerFlite automatic transmission torque converter, and the shock absorber piston—seen from left to right, respectively, in Fig. 3.

Other automotive parts produced from this same Super-Oilite material are seen in Fig. 4: (left) coupling for a hydraulic power steering unit; (center) shock absorber piston; and (right) shock absorber piston-rod guide. Guides and pistons for the Oriflow shock absorbers are furnished dry (without oil impregnation) to prevent contamination of the hydraulic fluid used in the unit. Typical of the tolerances that can be maintained with the powdered metal process are those specified in the dimensional drawing of a coupling for a hydraulic power steering unit, as shown in Fig. 5.

Other automotive applications of powdered metal parts include components of oil-pumps, door latches, water pumps, clutches, axles, steering gears, and brakes. Oilite friction materials, made by bonding friction-producing ingredients in a suitable metal matrix, have uniform friction qualities and high heat conductivity. Also, their resistance to high temperatures, glazing, and wear make them ideal for metallic clutch facings.

The use of an Oilite Bronze retainer (ball separator), in place of a solid bronze retainer for an automotive clutch throw-out thrust bearing, increased the life of the bearing thirteen times. This was due primarily to improved lubrication provided by the oil-impregnated retainer. In another automotive application, an Oilite Bronze plain sleeve bearing was substituted satisfac-

Fig. 5. This dimensional drawing of a coupling employed for a hydraulic power steering unit illustrates the tolerances that can be maintained in producing parts from powdered metal.





torily for an anti-friction bearing at only onefifth the unit cost. In both these cases, the cost and installation of a grease fitting was saved, and maintenance simplified.

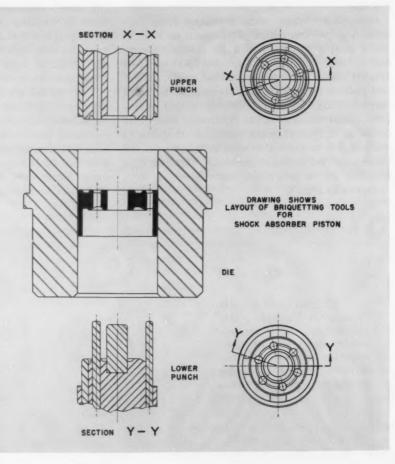
Production Techniques Employed

Although the basic steps in processing parts from powdered metal have remained essentially the same, there have been constant improvements in the presses and furnaces employed, die designs, and automatic handling. At Amplex, pure metal powders having carefully controlled properties are thoroughly mixed into an intimate blend. A powdered lubricant is added to the mix to assist in pressing.

Pressing of the mixed powders into briquettes is accomplished by compressing the powder in dies of the required shape and size. Pressures exerted vary from 15 to 50 tons per square inch, depending upon the materials being compressed and the density of briquette required. Briquetting is performed on both mechanical and hydraulic presses ranging in capacity up to 2000 tons, which includes what is believed to be the

Fig. 6. (Above) Set-up for die-pressing a mixture of copper and iron powders. Briquettes formed are later sintered and sized to produce shock absorber pistons.

Fig. 7. (Right) Die used for pressing shock absorber piston briquettes. Core-rods in the upper punch produce the small holes required in the top face of the piston.



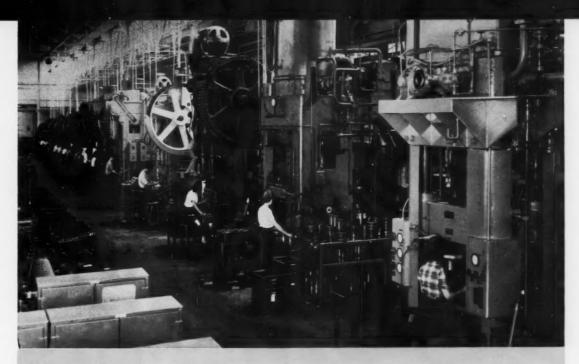


Fig. 8. Some of the many different sizes of presses employed at Amplex to obtain closer dimensions, higher densities, smoother finishes, or changes in shape of powdered metal parts.

largest automatic briquetting press in the world. For more uniform density, pressure is exerted on the metal powders from both above and below. This is accomplished on mechanical presses by a cam and lever system, or with a toggle joint for the upper punch and a floating die table for application of bottom pressure. On hydraulic presses, rams are provided for exerting pressure from above and below.

The press set-up used for die-pressing shock absorber piston briquettes is seen in Fig. 6, and the die for this operation is illustrated in Fig. 7. The center bore and small bleeder holes of the piston are formed by the core-rod inserts in the lower punch, and the inserts are guided by holes in the upper punch. After die-pressing, the lower punch withdraws and the briquette is ejected by the powder shoe, the press then repeating the cycle.

Clearances between mating die members are held to 0.0002 inch in producing accurate parts, and approximately 0.0005 inch for less accurate products. Such close tolerances are essential to prevent the fine powder from either escaping or becoming entrapped between the die members and causing seizing. Molding surfaces of the dies are lapped and polished to a mirrorlike finish not rougher than 5 micro-inches r.m.s., to minimize friction which might interfere with ejection and scratch, crack, or break the briquette.

Compensation must be made in designing the die for the slight increase in dimensions when

the briquette leaves the die (due to relief of the stresses), and for shrinkage or further growth during subsequent sintering, dependent upon the material, density, rate of heating, and atmosphere in the sintering furnace. For example, iron and brass briquettes usually shrink after sintering, while bronze parts grow.

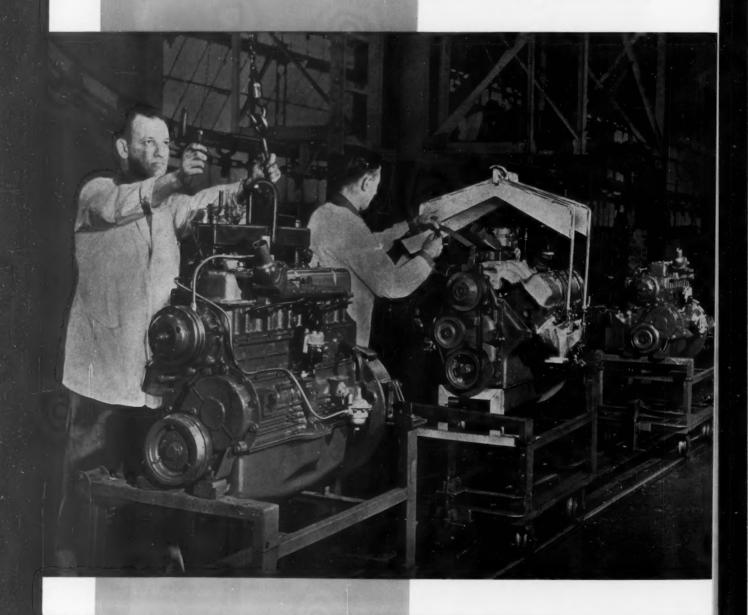
Sintering of the briquettes is done in continuous, controlled-atmosphere furnaces having automatic temperature controls and variable-speed conveyors. The temperature to which the briquettes are heated will vary with their composition, being about 1500 degrees F. for bronze and as high as 2300 degrees F. for stainless-steel materials. Time of heating will also vary from about thirty minutes for bronze to two hours or more for some iron alloys.

Sizing or coining operations consist of pressing the sintered parts in dies to obtain closer dimensions, higher densities, smoother surface finishes, or further modifications in the shape of the parts. A few of the many sizing presses employed at Amplex are seen in Fig. 8. A press set-up for sizing oil-pump gears is shown in the heading illustration.

Powdered metal parts which are to be selflubricating are immersed in an oil bath. The parts act as sponges and absorb oil up to 25 per cent by volume. After completing any necessary machining or grinding, and performing whatever critical inspection operations are required, the parts are ready for shipment.

Reo Converts Quickly to V-8 Production

By ARCHIE C. CAMPBELL
General Superintendent
Engine and Chassis Manufacturing
Reo Motors, Inc.
Lansing, Mich.



Quick conversion from the low-volume production of in-line, six-cylinder gasoline truck engines to a new V-8 engine was accomplished at relatively small cost by rebuilding existing machine tools and equipping them with special tooling

HE Reo Royale "Gold Crown" six-cylinder "L" type truck engine has been replaced by a "Gold Comet" six-cylinder engine and a new V-8 engine. Both the "Gold Comet" and V-8 gasoline truck engines are of the overhead valve type and employ the "wet sleeve" principle with replaceable cylinders. Two models of the V-8 engine are being produced: one having cylinders with a 4 1/8-inch bore by 4 1/8-inch stroke, a 441-cubic inch displacement, and a 220-H.P. rating; and the other, a 3 7/8-inch bore by 4 1/8-inch stroke, a 390-cubic inch displacement, and a 195-H.P. rating.

In setting up production facilities for the new V-8 engines, considerable ingenuity was exercised in rebuilding and reconditioning the existing machines formerly used for "Gold Crown" engine production. These machines were equipped with standard units and special tooling suitable for manufacturing the V-8 engines.

With this plan, retooling was completed in less than one year, and at a total cost of less than \$500,000—compared with a two-year retooling program at a cost of over \$3,500,000 for the "Gold Comet" engine about five years ago. An interesting feature of the retooling program was that production workers and machine operators formerly used on the "Gold Crown" line were employed as toolmakers in rebuilding and equipping the existing machines, with excellent results. Some of the outstanding set-ups and innovations developed for producing components of the Reo V-8 engine will be described in this article.

Standard drilling and boring units have been mounted on a specially built base for the operation illustrated in Fig. 1. An Avey drilling head, a Corwin boring unit, and a Leland-Gifford drilling head, together with a work-holding fixture, have been mounted on the base. In this operation, an oil-hole 5/16 inch in diameter is drilled in the cast-iron cylinder block, from the rear crankshaft bearing to a camshaft bearing; an oil-pump distributor line is rough-bored through two ribs of the casting; and a hole 17/32 inch in diameter is rough spot-faced. In the same set-up, also, a surface 2 3/16 inches in diameter is rough-faced, and a governor shaft hole 1 7/16 inches in diameter is rough spot-faced.

A Moline "Hole-Hog" four-spindle machine, Fig. 2, has been modified by providing a 45-degree angle-plate under the multiple-spindle head. Also provided on the machine is a Millholland horizontal drilling unit for use in counterboring, and a special work-holding fixture. With this set-up, the vertical spindles are employed to drill four oil-holes 5/16 inch in diameter, which form the right-hand oil line in the cylinder block; and the cored plug in the rear end of the block is rough-counterbored to a diameter between 1.233 and 1.237 inches, leaving 0.015 inch of stock in the bore for subsequent finishing.

The old fixture on the Ingersoll three-spindle milling machine seen in Fig. 3 has been altered to make it suitable for machining V-8 cylinder blocks. Two of the spindles are equipped with 13-inch diameter cutters for semi-finish- and finish-milling the sides of the bearing cap channel in the block. Width of the bearing lock channel is controlled within 0.001 inch in this operation. The third spindle carries one 5 1/4-inch diameter cutter for milling the bearing cap seat.

Since the drilling centers on the Baush vertical, multiple-spindle drilling machine shown in Fig. 4 can be easily adjusted, it was simple to adapt the machine to the production of the cylinder blocks. The machine has three stations, one for loading and unloading, and the other two for drilling. Thirty-two holes are drilled in each block on this machine—twenty holes being drilled in the cylinder head mating surfaces and twelve holes in the bottom channel of the block. Two blocks are drilled at a time, one being located in each drilling position and then interchanged. In the drilling position nearest the operator, the block must be relocated to drill both cylinder head mating surfaces.

Holes in the top mating surface of the block are drilled to a diameter of 31/64 inch for subsequent tapping with 9/16-12 threads to hold the head assembly studs. Four of the twenty holes are also counterbored to a diameter of 23/32 inch. Of the twelve bearing cap bolt holes drilled in the bottom channel of each block, two are drilled to a diameter of 5/16 inch for subsequent tapping of 3/8-16 threads, and ten to a diameter of 31/64 inch for 9/16-12 threads.

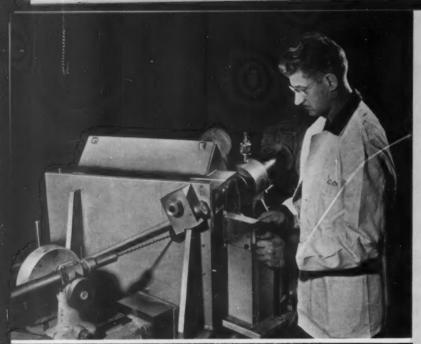


Fig. 1. Special base equipped with standard drilling and boring units for facing, drilling, boring, and spot-facing the V-8 engine cylinder block

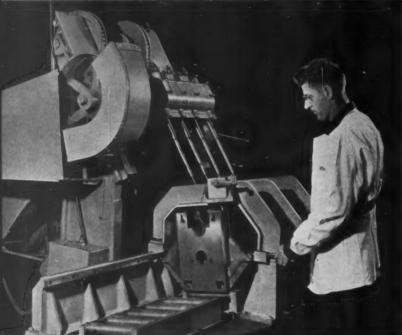


Fig. 2. Four-spindle drilling machine that has been modified for drilling angular oilholes in block. Cored plug hole is also counterbored on this machine.

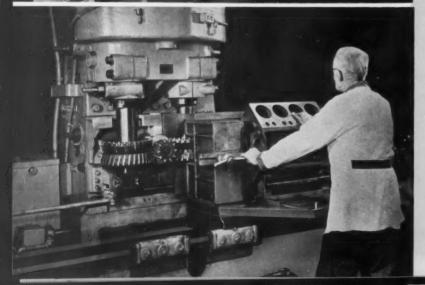


Fig. 3. Bearing cap seats and bearing cap channel in cylinder block are milled in this setup. Channel width is held within 0.001 inch.

The half-round bores of the bearing caps are rough-bored in an improvised set-up on a Wickes lathe, Fig. 5. A complete set of five caps is roughbored simultaneously, locating by means of dowels on the fixture which enter previously drilled holes in the caps, and securing by means of swinging clamps. The boring-bar, supported between headstock and tailstock centers in the lathe, carries six tool bits—spaced so that one bit bores each of the first four caps, and two bore the end cap, which is subsequently split. The work-holding fixture, mounted on the carriage of the lathe, is fed over the rotating boring-bar. Bearing cap bores are machined to a diameter between 3.065 and 3.073 inches in this operation.

After assembling the bearing caps to the cylinder block, the thrust faces, oil slinger groove, and rear cap of the assembly are planetary milled. Then the bores into which the sleeves will be assembled are machined on the Ingersoll fourspindle boring machine seen in Fig. 6. In rebuilding this machine, new spindles, a special fixture, and positive stops were provided. Also, electrical timers were supplied to control the dwell of the counterboring tools. This was necessary in order to maintain the depth of the counterbores within the required plus or minus 0.001 inch.

Upper portions of the four holes in one bank on the block are finish-bored to a diameter between 4.678 and 4.679 inches. The lower portions of the four holes are finish-bored between 4.564 and 4.565 inches in diameter. In the same operation, the upper bores are counterbored to a depth of 0.252 inch, plus or minus 0.001 inch. After reversing the cylinder block in the angular work-holding fixture, the four holes in the other bank are finish-bored and counterbored.

When the flywheel housing has been assembled



to the rear end of the cylinder block, the housing is semi-finish and finish-bored, faced, and chamfered by means of an ingenious tooling arrangement mounted on the spindle of a horizontal drilling machine. A cross-sectional drawing of the special tool-holder, Fig. 7, shows the four tool bits employed for these operations. Tool A semi-finish-bores the flywheel housing X, tool B finishes this bore to a diameter between 17.625 and 17.630 inches, tool C chamfers the bore, and tool D faces the end of the housing.



Fig. 4. (Above) A total of thirty-two holes are drilled in each cylinder block on this multiple-spindle machine. Twenty holes are drilled when the block is in position at left.

Fig. 5. (Left) A lathe has been modified to bore the half-round surfaces of bearing caps. Boring-bar is supported between headstock and tailstock.

November, 1954-201



Fig. 6. Holes in the block into which alloy cast iron cylinder sleeves will be assembled are finish-bored and counterbored four at a time on this machine.

Boring tools A and B are held in a casting E that is bolted to and rotates with a housing F connected to the spindle G of the horizontal drilling machine. With the cylinder block and flywheel housing assembly secured in a special work-holding fixture (locating from the Nos. 1

and 5 main bearings), the drilling machine spindle is fed toward the work. As tools A and B perform their boring operations, rack teeth cut in the end of spindle G rotate pinion H. Another pinion J (mounted on the same shaft as pinion H) meshes with rack teeth cut into the

Fig. 7. Cross-sectional drawing of tool-holder mounted on end of a horizontal spindle (G) for semi-finish- and finish-boring, facing, and chamfering flywheel housing (X).

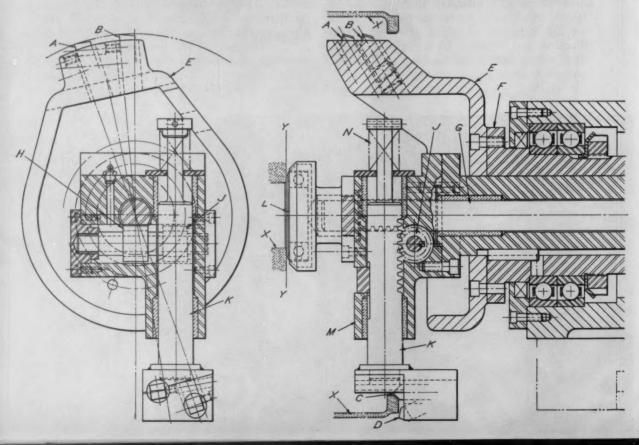
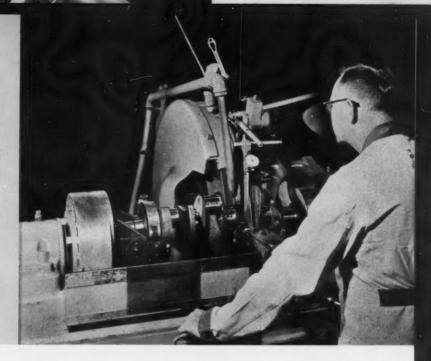


Fig. 8. Pin-locking indexplate on the left-hand pot chuck insures accurate indexing when rough-grinding pin bearing surfaces of crankshaft.



periphery of vertical shaft K. Since tools C and and D are mounted in a holder welded to the lower end of shaft K, they are fed outward to perform the facing and chamfering operations.

In-feed of the drilling machine is automatically stopped when nose L of the special tool-holder contacts the rear face Y-Y of the cylinder block. Then the tool-holder is retracted. Shaft K slides in bushings pressed into body M, and is returned to its starting position by a spring N.

In designing the V-8 engine, many parts were made interchangeable with the overhead valve, six-cylinder "Gold Comet" engine which continues in production. For example, the sleeves which form the cylinders are interchangeable. Also, the spacing of the cylinder bores, stud holes, crankshaft bearings, and cap bolt holes, as well as many other dimensions on the two engines, are the same. In this way, several of the special single-purpose machines on the "Gold Comet" line can be used for V-8 engine production.

For example, the Baush two-way, two-station horizontal drilling machines employed to drill, ream, and counterbore holes in top, bottom, and sides of the cast cylinder heads for the "Gold Comet" engine, are also used for the same operations on the V-8 engine heads. Since the spacing of the holes in both heads is the same, although the number of holes required varies, it is only necessary to remove a few tools near the ends of the V-8 heads and let some run idle. Also, the V-8 heads are preloaded on a sub-plate so that they fit the same fixtures.

On these machines, a cast cylinder head is manually loaded into one of two identical fixtures, locating pins are engaged by means of a hand-lever, and the head is secured by cam type, air-operated clamps. An air-operated elevator transfers the part to the upper station of the machine. In this position, eight valve guide holes (41/64 inch in diameter) are drilled in the top side of the head, and ten stud holes are drilled and two holes counterbored in the bottom side. When the casting has been transferred to the lower station, ten stud holes are drilled and two intake valve seats are counterbored in the bottom side of the head.

Main and pin bearing surfaces of the cast steel crankshaft are induction hardened with Tocco induction heating units. Pin bearing surfaces are rough-ground to a diameter of 2.549 inches plus or minus 0.001 inch on the Norton cylindrical grinding machine seen in Fig. 8. Approximately 0.025 inch of stock is left on the diameters and 0.022 inch on each face for subsequent finish-grinding. The crankshaft is supported between left- and right-hand pot chucks, and by a follow type steadyrest. To insure perfect indexing in grinding the four pin bearing surfaces (which are 90 degrees apart). the left-hand chuck has been provided with a special pin-locking index-plate. In this way, the work does not have to be loosened in the chucks, and the chance of human error during indexing is eliminated. An Arnold gage is provided for precision sizing of the pin bearing diameters.

Another special single-purpose machine, which is being used for both V-8 and "Gold Comet" engines, is the W. F. & John Barnes four-station, double-end, trunnion type machine seen in Fig. 9. This machine drills, reams, and taps all holes in both ends of the crankshaft. Since the V-8 engine crankshafts are shorter, one end is machined, and then the shaft is shifted on the fixture and the opposite end machined. Or, two crankshafts can be loaded at each station, one for the



Fig. 9. (Left) Double-end, four-station trunnion machine for drilling, reaming, and tapping ends of crankshafts. V-8 engine shaft has to be shifted after machining one end.

Fig. 10. (Right) This trunnion fixture on T-base of radial drill is set up for drilling and tapping intake manifolds. Additional wings of drill base have fixtures for holding other parts.



V-8 engine, and the other for the "Gold Comet" engine. The V-8 crankshaft, of course, has to be indexed through the machine a second time after repositioning.

A hole in the pilot end of the crankshaft is drilled (13/16 inch diameter), recentered (1 inch by 60 degrees), and tapped with 7/8-16 threads. Six holes in the flanged end of the crankshaft are drilled (27/64 inch diameter), reamed (0.4531 inch diameter), and tapped with 1/2-20 threads. Also, two dowel holes in the flanged end are drilled to a diameter of 15/32 inch and reamed to a diameter of 0.4930 inch.

All drilling and tapping of the intake manifold

for the V-8 engine are done on a Carlton radial drilling machine, Fig. 10. An interesting feature of this set-up is that the machine is equipped with a three-wing, T-shaped base. The cast manifold is secured on one wing in a trunnion fixture equipped with bushing plates in which the drill bushings are removed for tapping as required. Twenty-six holes are drilled and fourteen holes tapped in each intake manifold.

Another wing of the base is provided with a fixture for drilling and tapping the exhaust manifolds. The third wing on the base has two fixtures, one for drilling the timing gear cover, and the other for drilling the tappet cover.

Fig. 11. (Right) Angular riser blocks placed under the two heads of this standard duplex machine permit milling both of the head mating surfaces on intake manifold castings.



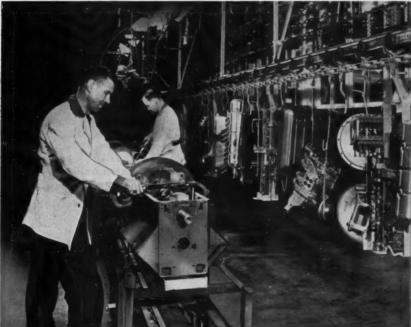


Fig. 12. (Left) Engine is assembled in a pressurized, dust-proof room that is maintained at temperature of 70 degrees F. Parts conveyor at right is synchronized with assembly line.

Another good example of standard machine modification for V-8 engine production is illustrated in Fig. 11. Here, the two heads of a standard Cincinnati duplex milling machine have been mounted at angles of 45 degrees by placing angular riser blocks underneath the heads. The spindles carry inserted-blade cutters, 4 5/8 inches in diameter, for milling the head mating surfaces on the intake manifold.

Assembly of critical parts of the engine which require precision fitting, such as sleeves, pistons, rings, connecting-rods, and bearings, is performed in an enclosed area, Fig. 12, that is pressurized with washed air to make the room dust-

proof. This room is maintained at 70 degrees F. the year round because it has been proved that controlled fitting temperature and precision tolerances stop seizing, searing, and knocking during engine operation. Also, the elimination of dirt adds to the life of the engine. A parts conveyor, seen at the right, is synchronized with the flow of the assembly line to insure that required components are readily available.

After painting, assembly of the engine is completed as seen in the heading illustration. The engines at the left and right are both "Gold Comets," while a new V-8 gasoline truck engine is shown in the center.

Power Steering Units Require Precision Manufacturing Methods

By E. R. ZAHNOW, Tool Engineer Saginaw Steering Gear Division General Motors Corporation Saginaw, Mich.

Increased demand for hydraulic power steering units in automobiles has made it necessary to boost production facilities. Unusual setups and close-tolerance machining operations employed in making hydraulic components for these units will here be described

NCREASED front-wheel weight and the use of lower-pressure tires have made hydraulic power steering units a most welcome addition to modern passenger cars. The convenience and luxury of such units, particularly in parking, have made them popular even on our so-called light cars. Greater demand for power steering units has made it necessary to continually boost production facilities. Some of the more interesting set-ups and precision machining operations employed in making hydraulic components for these units will be described in this article.

Power steering units made by the Saginaw Steering Gear Division for use in all General Motors automobiles and some cars made by other manufacturers contain a mechanical steering gear, a hydraulic booster, and a spool type control valve, all in one compact housing. Oil under a pressure of 750 pounds per square inch is supplied from a small reservoir by a vane pump

that is driven by a V-belt from the crankshaft of the automobile engine.

Mechanical steering is accomplished by means of a Saginaw low-friction, recirculating ball type element in which a number of steel balls act as a rolling thread between the steering worm and a ball nut. The ball nut is geared to a sector on the pitman shaft, and the piston-rod of a double-acting piston is provided with teeth which mesh with a gear sector on the pitman shaft. Power assistance is provided only when the driver demands it by rotating the steering wheel.

Driving shafts for the vane pumps of the steering units are produced from steel bar stock on an Acme-Gridley eight-spindle, automatic bar machine. An unusual feature of this set-up is that a bearing seating surface, 0.9685 inch in diameter, on the multiple-diameter shaft is hardened while it is on the automatic machine. This is accomplished by means of a Tocco induction heating head mounted on a cross-slide at the



sixth position of the automatic—seen at right center in Fig. 1.

As the cam-actuated cross-slide is automatically advanced, the semicircular heating coil envelops the rotating vane-pump driving shaft. Current is applied to the coil for about two seconds, and the bearing surface on the shaft is heated by induction. Then, oil (the same as is used at other positions for machining) quenches the heated surface to provide a minimum hardness of 45 Rockwell C. This hardening operation does not reduce the normal production rate of the machine, which is eighty-eight shafts per hour at 75 per cent efficiency. Previously, the shafts were hardened after machining, requiring individual handling and approximately two seconds for performing the heat-treating operation on each shaft.

Machining operations performed at other positions on the eight-spindle automatic bar machine are spot-drilling, center-drilling, turning, forming, grooving, shaving, thread rolling, facing, chamfering, and cutting off. Finishforming and turning are performed at the fifth position of the machine, with the shaft supported by a spring type, rotating tailstock center. Cut-off of the machined shaft to the required length is done at the seventh position,

immediately after the bearing surface has been heated and quenched.

Five surfaces, including the induction hardened bearing surface, on each vane-pump driving shaft are rough- and finish-ground on Cincinnati No. 2 centerless grinding machines. From 0.004 to 0.006 inch of stock is ground from the different surfaces on the multiplediameter shafts during rough-grinding, and another 0.001 inch in finish-grinding. Vitrified bond, aluminum-oxide abrasive wheels of 60 and 100 grain size are used for rough- and finishgrinding, respectively.

The set-up employed for finish-grinding the shafts is illustrated in Fig. 2. Shafts are manually placed on a loading cradle, one at a time, which automatically lowers them to a position between the two regulating and two grinding wheels. The regulating wheels are 12 inches in diameter and the grinding wheels, 20 inches in diameter. This machine is equipped with a Bellows air-feed unit which automatically advances the wheels a pre-set distance under controlled thrust. One of the surfaces is ground to size within 0.0004 inch, and a total tolerance of 0.0003 inch is maintained in grinding another critical surface. A production of 286 shafts per hour is obtained in this precision operation.

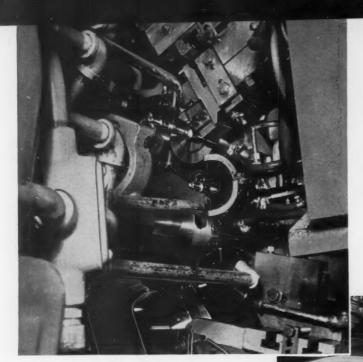


Fig. 1. (Left) Induction heating head, seen at the right center, is mounted on cross-slide of this automatic bar machine to harden shaft.

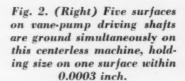




Fig. 3. (Left) Double-indexing, eight-spindle, automatic chucking machine employed to bore, turn, and face valve pump body castings two at a time.

Bodies for the vane pumps are made from S A E 120 cast iron. Since these parts will be subjected to pressures up to 1000 pounds per square inch, great care must be taken to obtain a dense, homogeneous casting. The castings have a Brinell hardness of 179 to 228, and a minimum tensile strength of 35,000 pounds per square inch.

Vane-pump body castings are machined, two at a time, on an Acme-Gridley eight-spindle, automatic chucking machine, Fig. 3, which is set up for double indexing. Machined bodies are unloaded and rough castings are loaded in hydraulic chucks at the first and second positions. At the third and fourth positions of the automatic chucker, seven internal surfaces in each casting are machined with tungsten-carbide tipped counterboring tools, such as the one shown diagrammatically at the top in Fig. 4. Also, at the same positions, the bodies are roughfaced and rough-turned with carbide-tipped tools.

When the body castings have been indexed to the fifth and sixth positions, four under-cuts are machined in the bore of each part, using swinging-arm type recessing attachments, such as the one shown at the center in Fig. 4. At the seventh and eighth positions, the bores in each body are finish-machined with five-step reamers, their flanges are finish-faced, and the castings are faced to length. The facing tools are relieved, at the completion of their cuts, by hydraulic units provided at both positions. The multiple-diameter reamers are mounted in floating holders secured to the main tool-slide of the machine. Also, a bearing surface on the periphery of each casting is finish-turned. The tools for these operations are seen at the bottom in Fig. 4. Production attained is approximately 125 valve pump bodies per hour.

An unusual method is employed for cutting teeth on the pitman shaft gear. The five-tooth gear segment is produced on a special Fellows gear shaper having a reciprocating rack type cutter, Fig. 5. The forged-steel pitman shaft is secured in the headstock fixture by means of a screw clamp, using a power wrench for tightening. As the shaft is rotated, the rack cutter is reciprocated and fed past the work-piece to generate the teeth.

The gear teeth are of 5 diametral pitch, and have a 0.6283 circular pitch with a 22 1/2-degree pressure angle in a transverse plane. To obtain the required taper at the roots of the teeth, the rack cutter is inclined at an angle of 7 degrees 30 minutes. Each machine can produce twenty pitman shaft gears per hour.

Ball nuts for the recirculating element of the mechanical steering unit are made from SAE 5120 hot-rolled steel. The four rack teeth on one

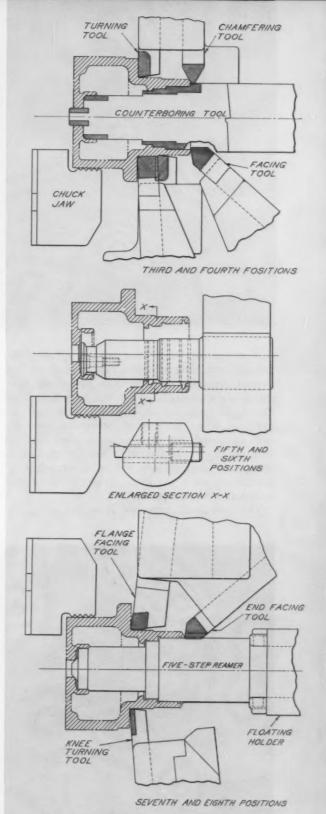


Fig. 4. Multiple tooling employed on the automatic chucking machine seen in Fig. 3. Facing tools are hydraulically relieved at the seventh and eighth positions.

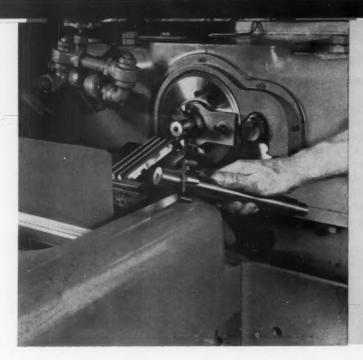


Fig. 5. Five-tooth gear segments are produced on forgedsteel pitman shafts by feeding reciprocating rack cutter past the rotating work.

face of each nut are produced on a dual-ram, vertical broaching machine, Fig. 6, made by the Detroit Broach Co. Cincinnati broaching machines are also employed for this operation. The 15-ton, 90-inch stroke machine illustrated is equipped with two sets of broaching tools on each ram, and two double-station work-holding fixtures in which the nuts are hydraulically clamped. Thus two nuts are being broached in one fixture while the other fixture is being unloaded and reloaded as the ram rises.

The rack teeth, broached from the solid, are

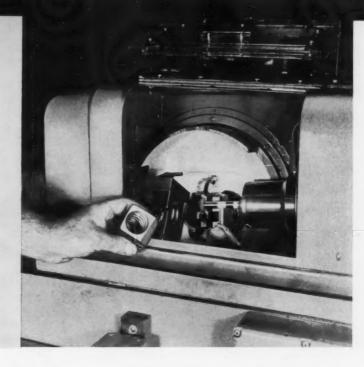
0.4465 inch deep and have a pitch of 0.6283 inch with an included angle of 45 degrees 20 minutes 56 seconds. Each broaching machine completes 500 ball nuts per hour. Wire brushes are clamped to the coolant pipe above the work-holding fixtures, as seen at the top in Fig. 6, to remove chips from the broaches as the rams rise. The ball nuts are copper-plated on all surfaces except the ends prior to broaching the rack teeth and cutting the internal thread grooves, so that these machined surfaces can be selectively hardened.

Jones' & Lamson internal thread grinders.



Fig. 6. Dual-ram broaching machine equipped with two double-station work-holding fixtures for cutting the rack teeth in faces of ball nuts for mechanical steering units.

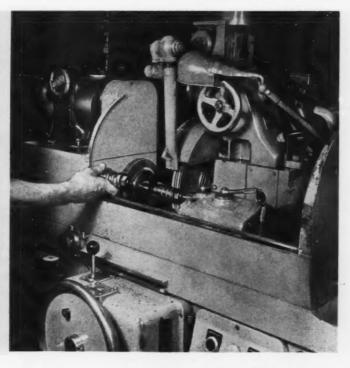
Fig. 7. Thread grooves in bores of ball nuts are roughand finish-ground on this machine. Wheel is dressed automatically with two diamonds.



such as the one shown in Fig. 7, are employed to rough- and finish-grind the internal thread grooves in the ball nuts after heat-treatment. The right-hand internal thread grooves have a lead of 0.41304 inch and a helix angle of 7 degrees 3 minutes with a theoretical ball diameter of 1.0625 inches. The nuts are manually clamped in a pot type chuck having a stationary and sliding V-block, locating from the broached rack teeth since the center line of the thread groove must fall within 0.002 inch either side of the rack center line.

The grinding wheel, a vitrified bond, aluminum-oxide wheel of 60 grain size, which is rotated at 19,000 R.P.M., is automatically dressed by means of two diamonds and a pantograph mechanism after rough-grinding each ball nut. During dressing, the wheel is automatically slowed to half-speed to reduce the wear on the diamonds. During grinding, the wheel is automatically fed toward the work until the correct size groove is reached, at which time the feed automatically stops. Also, the wheel is advanced automatically to compensate for its de-

Fig. 8. Notches are ground in faces of annular grooves on valve spools in this set-up, holding distances of notch faces from end of spool to 0.0005 inch.



creased size after dressing. Each machine roughand finish-grinds thirty ball nuts per hour. Ex-Cell-O internal thread grinders are also used for this operation.

Valve spools that accurately control the flow of oil are critical to the operation of the hydraulic power steering units, and must be manufactured to close tolerances. The spools are made from SAE 1118 steel which is carburized to obtain a case depth of 0.03 inch and a minimum hardness of 58 Rockwell C. then the parts are dimensionally stabilized by sub-zero treatment.

Each valve spool has two accurately spaced annular grooves, 0.3377 inch wide by 0.153 inch deep. Notches, 0.005 inch wide by 0.03 inch deep, must be ground in both faces of each groove—maintaining the distance of the notch faces from one end of the spool within 0.0005 inch. This is done on a Sheffield precision thread- and formgrinding machine, Fig. 8, equipped with a single multiple-form wheel that is crush-dressed.

All four notches in both grooves are ground simultaneously with the valve spool mounted on an arbor that is held between centers on the machine. Approximately 0.005 inch of stock is ground from each face in a plunge cut. A hard-

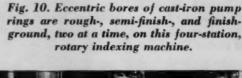
ened steel roll of the required shape is used to crush-dress the wheel after grinding about 300 valve spools. The electrically powered Crushtrue dresser is mounted on a bracket and slide, as seen above the grinding wheel in Fig. 8. Sixty spools can be ground per hour on each machine.

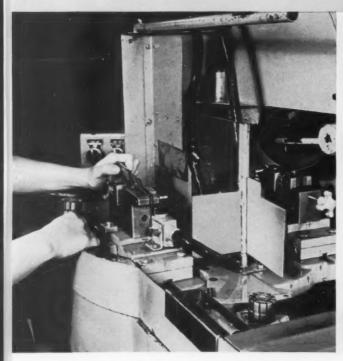
Rotors for the vane pumps used in the hydraulic power steering units are made from SAE 4620 steel bar stock. After milling twelve equally spaced radial slots in each rotor and broaching splines in their bores, the parts are carburized to give a case depth between 0.010 and 0.020 inch having a hardness from 81.2 to 83.4 Rockwell A.

The radial vane-holding slots, 0.328 inch deep, are then finish-ground to a width between 0.0780 and 0.0785 inch. This operation is performed on special Thompson slot-grinding machines, such as the one shown in Fig. 9. The rotary indexing table of the machine is provided with two workholding fixtures which are indexed by hand. While a slot in one pump rotor is being ground, the rotor in the other fixture is being indexed or, if all the slots have been ground, unloaded.

From 0.0005 to 0.0015 inch of stock is ground from the sides of each slot, holding the surfaces

Fig. 9. Radial vane-holding slots in pump rotors are ground to width within 0.0005 inch in this set-up. Rotary table carries two work-holding fixtures.





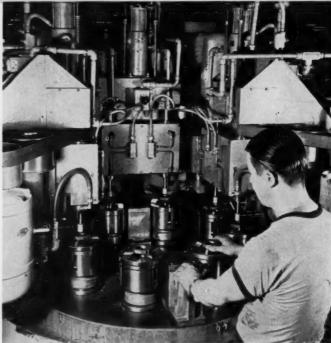
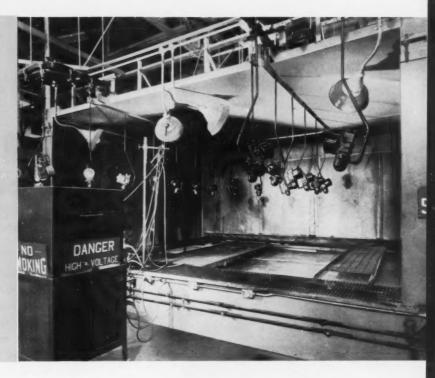


Fig. 11. Pump assemblies mounted on hangers suspended from an overhead monorail are automatically painted with black enamel in this electrostatic set-up.



square with the sides of the rotor within 0.001 inch. A resinoid-bond, aluminum-oxide abrasive wheel of 80 grain size is employed. The wheel, which rotates at 3274 R.P.M., is 14 inches in diameter and 0.093 inch thick, and is dressed down to the required slot thickness. Redressing is required after grinding about 1000 rotors.

Close tolerances must also be maintained in contour-grinding the eccentric bores of cast-iron pump rings. This is done on a special Hoern & Dilts four-station, indexing type cam-grinding machine, Fig. 10. The rotary indexing table of the machine is equipped with eight air-operated work-holding fixtures so that two rings are being ground at each of three stations while two more are being loaded or unloaded. In this way, 240 pump rings can be ground per hour. Previously, ten internal grinding machines were required to attain the same production.

Two-spindle grinding heads, carrying wheels 15/16 inch in diameter by 1 1/4 inches long, are provided at the three grinding stations. Vitrified-bond, aluminum-oxide abrasive wheels of 46 grain size are employed. At the first station, approximately 0.010 inch of stock is contour-

ground from the eccentric bores of two pump rings. Semi-finish-grinding, in which 0.005 inch more of stock is ground from the bores, is performed at the second station. When the rings have been indexed to the third station, a final 0.002 inch of stock is removed in finish-grinding. Both work-holding fixtures at each station are rotated. The wheel-heads follow a cam-controlled contour.

Pump assemblies are automatically painted with rubber-base, air-drying black enamel in the electrostatic paint spray booth seen in Fig. 11. The assemblies are suspended on 2-foot centers from hangers which travel through the paint booth on an overhead monorail conveyor. Rollers provided above the hangers contact a track on top of the spray booth to rotate the work-pieces. The pump assemblies are grounded through the monorail, and the paint is charged with a 35,000volt, 60,000-microampere current. In this way, paint particles are attracted to the work-pieces. Any overspray is collected by the water curtains provided on three walls of the booth. With this set-up, the pump assemblies are painted at a rate of 550 per hour.

Automotive Hardware an Atwood Specialty

An annoying door rattle in an automobile bought by a vacuum-cleaner maker back in 1916 completely changed the nature of his business. Starting with an adjustable door bumper, the concern today makes a variety of accessories for an impressive list of car and truck manufacturers.



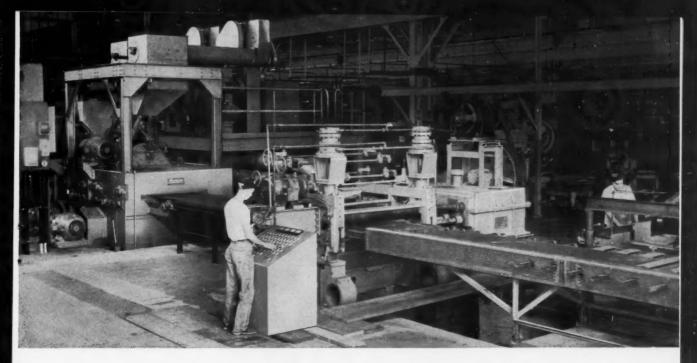


Fig. 1. The travel of the sheets through the flattener and descaler is controlled from a central operating panel.

ROM the modern plants of the Atwood Vacuum Machine Co. in Rockford and Stockton, Ill., flows a steady stream of interior body, door, hood, and trunk assemblies; and hinges, locks, seat-adjusters, props, shock-absorber brackets, and accelerator shafts—hardware items for the automotive industry. Some of the practices and equipment which are highlights in the company's activity are here described.

One of the innovations is a production line for mechanically descaling steel sheet and coil stock in preparation for press-working. The former practice had been to descale all hot-rolled steel received from the mills by pickling. This involved considerable materials-handling and high shipping costs, since the pickling was done by another concern.

The new line, in addition to largely eliminating these costs, has other advantages. Material is saved, since none of the virgin steel is removed by mechanical descaling. Also, it is claimed that the steel shows superior cold drawing and cold-forming qualities. And eventually, when shearing and slitting equipment is added to the end of the line, it will be possible to reduce drastically the steel inventory that has to be maintained at the plant because of the variety of part sizes.

Incoming bundles of sheet steel are moved in from the yard on a 40-foot conveyor to a magnetic lifting device. Here, one sheet at a time is picked up and transferred laterally to a skew table leading to a Fessler flattener. This machine is shown in the center of Fig. 1. When coiled

stock is to be descaled, the skew table is rolled back, and the stock is supported on a mandrel in a pit next to the machine. The sleeves that serve as bearings for the mandrel can be seen in the illustration.

In the flattener, the material travels through a group of three rolls arranged so as to pinch and curl it, thus loosening the scale. Advancing between two tiers of four rolls each, the material is returned to its flat state, and an intermediate motor-driven belt conveys it to a large Wheel-abrator which performs the actual mechanical descaling.

A close-up view of this unit is shown in Fig. 2. The cleaning method employs an airless abrasive blast of hardened cast-steel shot hurled by centrifugal force at high velocity against the work. For this, the descaler has four paddle-like wheels, 19 1/2 inches in diameter and 5 inches wide, individually belt-driven from 40-H.P. motors. Wheel and conveyor axes coincide, with two "down-blast" wheels operating above the work, and two "up-blast" wheels below the work.

In the blast area, the work moves between four rolls which are staggered to give continuous support. The shot descends from large hoppers through spouts leading to each wheel. Rotating at 2250 R.P.M., the wheels hurl the shot against the work at a speed of 14,000 feet per minute.

Screw conveyors rotate in a pit in the unit, directing the expanded shot to bucket type elevators which return it to the hoppers. Scale and shot are separated in the hoppers by a con-

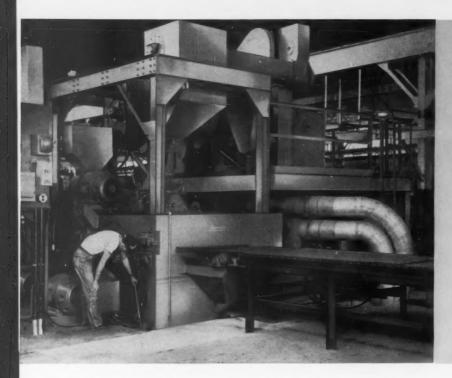


Fig. 2. Advancing from the flattener, the sheet is seen entering the mechanical descaling unit.

trolled current of air; being lighter, the scale is exhausted through ducting.

In leaving the Wheelabrator, the stock is coated with oil before being stored or transferred directly to the press section. The "orange peel" finish obtained in the mechanical descaling operation provides a good base for the lubricant. In Fig. 3 can be seen the company-designed device for applying the oil. This is done by spraying as the stock rides through a booth. An open table consisting of a series of rotating discs makes it possible to have the spray impinge on both sides of the material.

Channel sections, tubing, and molding for automotive hardware are cold-formed on the Yoder machines seen in Fig. 4. One such part, in production on the machine in the foreground, is an outer-race channel for a front-seat adjuster. The section is developed progressively as the original coiled stock moves through eight roll-stands.

Each stand has an upper and a lower spindle on which are mounted mating form rolls. The various pairs of rolls form the strip into the shape desired at the particular stage, the eighth and last forming the finished contour.



Fig. 3. At the exit end of the descaling machine, the sheets are automatically lubricated, then stacked.

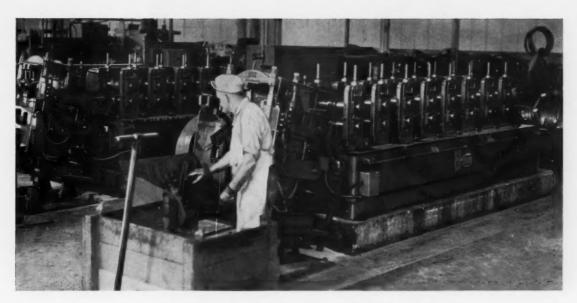


Fig. 4. Channel sections are developed from coiled stock as the strip advances between pairs of formed rolls.

At the exit end of the machine, the strip is passed through a cut-off die of the same contour. This die is similar in design to cut-off dies used on punch presses. However, instead of the die set being mounted on a ram and a bolster plate in a fixed position, it is carried on slides which travel away from the cold-forming machine at the same velocity as the strip. At a pre-set point, the die is actuated automatically to cut the channel to the required length. Then the slide retracts and repeats the cut-off cycle for the subsequent channel length.

Typical of the many press operations that may be required for a parts assembly is the one illustrated in Fig. 5. Here, lower-gear links for hood hinges are being pierced and blanked. A part can be seen on the paddle used by the operator to retrieve the work as it is stripped from the die on the up stroke of the ram. The tooth form seen on the link is provided for in the design of the compound die. A Bliss 215-ton straight-side press is employed for the operation. The part is blanked from 5/32-inch carbon steel strip, 9 inches wide.

For stamping high-volume items like front seat-adjuster supports, press lines are set up with connecting chutes down which the parts flow, Fig. 6. This line consists of one Warco

Fig. 5. A lower-gear link for a hood hinge can be seen on the paddle as it is retrieved by the operator.



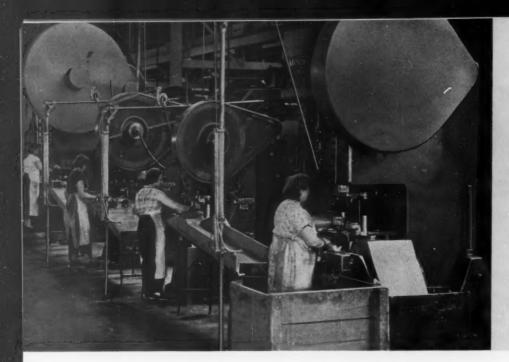


Fig. 6. Seat-adjuster support is formed and pierced as it advances down a line of presses.

(200-ton) and three Minster (56-, 45-, and 93-ton) open-back inclinable presses, and is turning out 7000 supports per eight-hour shift.

Pull-out safety devices are standard equipment for all punch presses throughout the shop. On presses having air friction clutches, micro switches are installed in the dies, to assure positive positioning of the work and avoid damage to the dies.

Modern tool-room techniques help Atwood meet the die requirements of its many presses. Forming and truing of grinding wheel shapes, for example, are greatly accelerated by the attachment seen in the heading illustration. Here, the toolmaker is developing a convex shape on the wheel periphery which will be used to grind a die part.

A Diaform wheel-forming attachment is

mounted on the table of a Cincinnati No. 2 cutter grinder. This is a highly sensitive pantograph employing a 10 to 1 reduction ratio between a tracing template and a spindle carrying roughing and finishing diamonds. These diamonds operate beneath the wheel, on its vertical center line. With the template held against an aligning plate, the form is trued into the wheel as the tracer arm is gradually raised into contact with the template in a series of passes.

The template is the reverse of the desired wheel form. Should a wheel also have to be trued to grind the punch member of a die set, a mating template can be readily cast in type metal, using the die template as a master.

One of the progressive dies is illustrated in Fig. 7. The five stations of the die pierce, emboss, extrude, form, and cut off the plate. After



Fig. 7. The jig borer also serves as a measuring machine to check the station center distances of the progressive die.

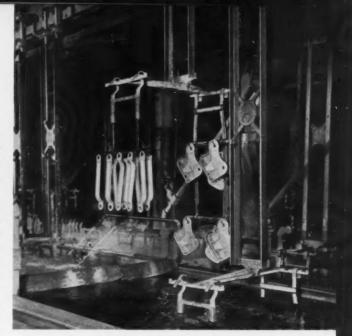
Fig. 8. Except for loading and unloading, the parts go through zinc-plating cycle automatically.

assembly of the various parts, station center distances are inspected on a Pratt & Whitney No. 2A jig borer for an accuracy of within 0.0002 inch.

A punch at one of the stations is aligned with the spindle, after which the table is moved the correct distance by reference to end measuring rods, an inside micrometer, and a built-in dial indicator. A punch or a hole at an adjacent station is then indicated from the spindle for alignment.

Prior to assembly, all steel stampings are rust-proofed by zinc-plating. Parts that can be hung from racks go through a completely automatic cycle on a Hanson-Van Winkle-Munning plating line. The close-up view of the equipment, Fig. 8, illustrates tail-gate props and hood hinges suspended over one of the baths. These particular parts are plated to a thickness of 0.00035 inch in approximately thirty-two minutes. Conveyor racks move continuously at a speed of 60 inches per minute, lowering and raising from bath to bath.

The ten stages of the cycle are as follows: (1) electrolytic cleaning—at 180 degrees F., charged at 8 ounces per gallon; (2) running cold-water rinse; (3) pickling—50 per cent hydrochloric acid and inhibitors; (4) and (5) running cold-water rinses; (6) cyanide and caustic dipping; (7) zinc-plating—4 to 5 ounces of metal, 9 to 11 ounces of sodium cyanide, 10 to 11 ounces of sodium hydroxide per gallon of solution, and an organic brightener; (8) and



(9) running cold-water rinses; and (10) hot-water rinse—at 180 to 200 degrees F.

Small parts not readily suspended from the racks of the automatic equipment are zinc-plated in a Udylite barrel line. Here, a series of motorized cleaning and plating tanks are arranged in a horseshoe. The work is contained in perforated cylinders of Monel metal which are transferred from tank to tank by a cable hoist. This activity is shown in Fig. 9.

Each cylinder is supported in a yoke, and is free to revolve. Gears are located at one end of the cylinder, and when the cylinder is positioned in any of the tanks, the gears form a train from a reduction motor. The parts are continuously tumbled during the cycle, assuring uniform plating. To obtain a plating thickness of 0.0003 inch, a typical cycle takes thirty minutes.

Fig. 9. When lowered into position in the tank, the perforated cylinder is rotated from a reduction motor through a gear train.



Willys Modernizes Its Forging Facilities

Political Politi

All forgings for Willys vehicles, such as camshafts, crankshafts, connecting-rods, counter-weights, steering arms, and knuckles are made by the Division. Also in production are ordnance items ranging from 1/2-pound springs to 300-pound jet-engine rings.

Altogether, there are thirty-seven steam drophammers (from 2000 to 35,000 pounds) and five forging presses (from 750 to 4000 tons). Included are two new Erie 35,000-pound giant hammers. There are only ten such hammers in the country at the present time. Crankshafts for Jeep engines are forged on the 12,000-pound Erie steam drop-hammer shown in operation in Fig. 1. The work is progressively edged, blocked, and finished in the three impressions of the die. The hammerman can be seen removing a crankshaft from the finishing impression.

The original billet is square-shaped, of S A E 1045 steel, and weighs 62 pounds. It is brought to a forging temperature of 2100 degrees F. in a slot type furnace located near the front of the hammer. After forging, the hot work is transferred to an adjacent 400-ton trim press where the excess metal, or flash, around the parting line is removed. Then, in a 250-ton press, the crankshaft is given a restrike in a single blow which serves to size the work and iron out any irregularities.

The operation requires a crew of five: two hammermen, who work alternately; a heater, who loads the furnace and transfers the billets

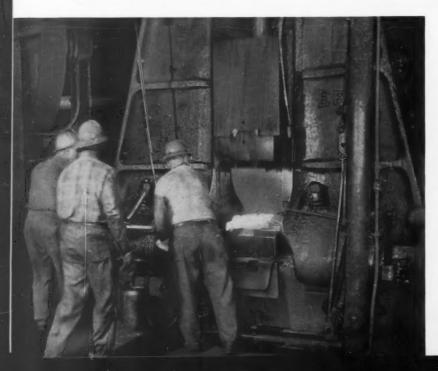
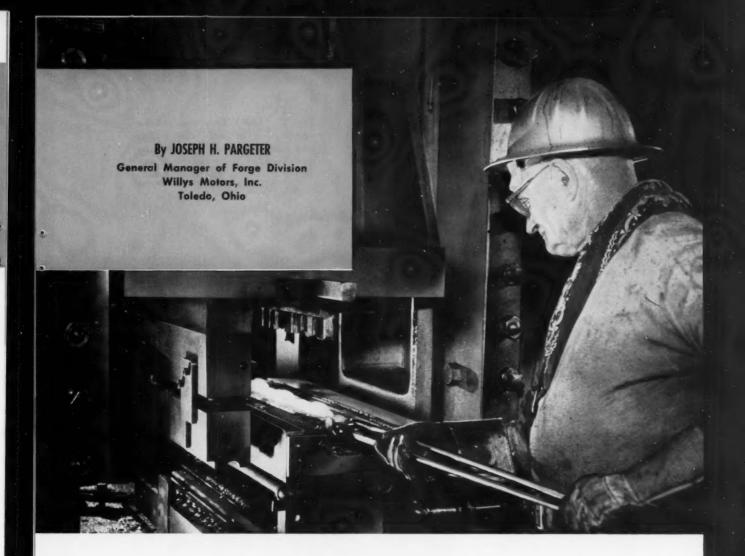


Fig. 1. A crankshaft is being removed from the finishing impression in this forging operation. Subsequently, adjacent presses perform hottrimming and restriking operations.



to the forge; a trimmer, who also steam-cleans the scale from the dies and swabs them with oil each cycle; and a restriker. Progressive shapes in the development of the crankshaft are illustrated in Fig. 2.

A typical example of resourceful die design which is effecting economies in the forge is the combined trimming and restriking operation seen in the heading illustration. This is a close-up view of a 250-ton Minster press, showing the worker positioning a camshaft for a six-cylinder engine. Developed from a round bar, the camshaft was drawn, rolled, and finish-forged on a 5000-pound Erie steam drop-hammer.

Trimming and restriking dies are arranged adjacently, and their corresponding punches are carried by the press ram. Each work-piece goes through a two-stroke cycle. On the first stroke, the trimming punch removes the flash, forcing the camshaft through the trimming die onto a ramp. Rolling down the ramp, the work automatically positions itself in the restriking die for the second stroke of the cycle.

The advantages of this die design are appar-

ent. Added to the economy of combining trimming and restriking in a single press operation is the labor saved by dispensing with the handling of the camshaft by the press operator in its transfer from the first to the second die.

In Fig. 3, a link for a tank track is shown during hot-trimming on another Minster 250-ton press. Billets are heated in the adjacent combination gas- and oil-fired furnace. Each billet weighs 31 pounds and produces two links. These are forged one at a time on the 5000-pound hammer seen at the right.

Following trimming, an ear on one side of the link is hot-formed on another press so as to be at right angles to the link body. The forming die is also designed to restrike and coin the entire link to remove any irregularities.

Seven Surface Combustion furnaces representing a cost of \$2,000,000 constitute an important part of the Division's newly expanded capacity. One of these mammoth furnaces, a continuous conveyor type, heats, quenches, and draws all crankshaft forgings. Two others having vibrator feeds, heat, quench, and draw the

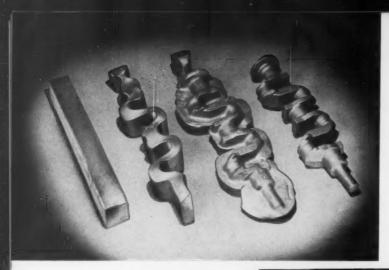


Fig. 2. (Left) This view shows (beginning at left) the billet; and the crankshaft after edging and blocking, after finishing, and after trimming and restriking.

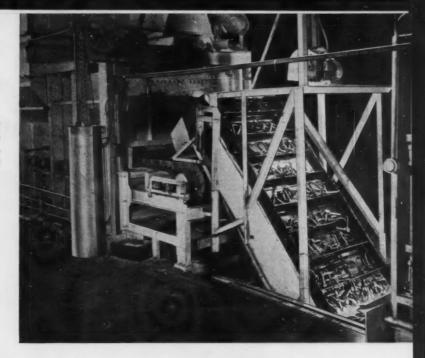
Fig. 3. (Right) Trimming a tank track forging after it leaves the steam drop-hammer. Subsequently, the work is bent, restruck, and coined in a combined operation.





Fig. 4. (Left) Loading connecting-rods on feeding lanes. Heat-treating these forgings takes two hours and forty minutes.

Fig. 5. Leaving quenching tank, hardened forgings are automatically conveyed to the annealing chamber of the heat-treating furnace.



smaller forgings. Four furnaces anneal miscellaneous forgings which require no other heattreating, as well as many of the castings used on Willys production lines.

Different views of one of the vibrator-fed furnaces are shown in Figs. 4 and 5. At the furnace entry, Fig. 4, connecting-rods are being loaded onto dual feeding lanes which slope slightly toward the heating chamber. Beneath the lanes can be seen vibrator mechanisms, which at pre-set intervals produce a rapid oscillation of the lanes and cause the rods to advance onto an endless belt within the chamber. Quenching in a sub-floor tank follows heating, after which the parts are automatically conveyed up an incline, as can be seen in Fig. 5, leading to the door of an annealing chamber.

In the die shop, modern metal-working equipment transforms special alloy-steel blocks into the closed impression, trimming, and restriking dies required by the forge. Cutting the blocks to length is performed on the Marvel hacksaw illustrated in Fig. 6. This machine can accommodate a 24-inch square block.

The blade shown has three teeth per inch, and is cutting through the metal at a rate of 2 1/2 inches per hour. A hydraulic system lowers the head housing for the feed motion, then raises it rapidly once the work has been cut through.

In being drawn across the work, one end of the blade is progressively raised and the other end lowered. The rolling motion produced leaves a slightly curved cutting surface. As a result, at any moment in the stroke the blade is in con-

Fig. 6. The blade of this hacksaw operates in a curve to reduce the feeding pressure and provide increased chip clearance.

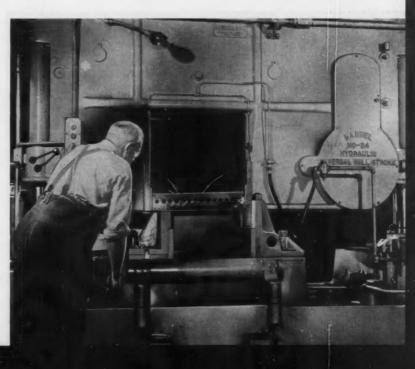




Fig. 7. The impressions for a track link forging die are being sunk automatically on this tracer-controlled milling machine.

tact with only a short section of the work, thus reducing the feeding pressure required, as well as providing increased chip clearance.

The horizontal roller seen in the foreground of Fig. 6, is used as a work-support to protect the table. For this, it has a pair of eccentric bearing surfaces in two end brackets. To load the work, the roller is rotated and locked in a position where its periphery is slightly above the level of the table. When the work is correctly located in the vise, the roller is rotated out of contact. A second roller functions similarly on the other side of the table.

One of the Cincinnati vertical Hydro-Tel milling machines used for die-sinking is shown in Fig. 7. Here, a die for a track link forging is being machined. Approximately 90 per cent of

the areas of the impressions are irregular, and are automatically traced from templates by angle and radius cutters.

A die such as this produces about 7000 forgings, after which it is planed smooth and resunk. The block can be reworked three times and still be above the minimum height of 14 inches required by the hammer.

Of the battery of four new Cincinnati shapers used by the diemakers, two can be seen in Fig. 8 machining parts for a hot-forming die. This die gives the final shape to a steering arm forging after it is hot-trimmed. On the machine in the foreground, the lock for the work and the hinge portion of the die are being shaped. The punch section can be seen in work on the machine in the background.



Fig. 8. Shaping a hot-forming die for an automotive steering arm. Contour of part makes a post-forging operation necessary.

"West-ing-arc" Process Welds Steel with Consumable Electrode



A NEW wire is the key to a process adapting consumable electrode inert-gas arc-welding to mild-steel work. The "West-ing-arc" MS-20 wire, developed by the Westinghouse Electric Corporation, has a special coating which stabilizes the arc and thus permits the advantage of the fast burn-off rate of positive polarity. It is available in four sizes, from 0.040 to 0.091 inch in diameter. Optimum results are obtained when the wire is used in conjunction with a newly designed gun, wire control, and constant-potential power source—a 500-ampere direct-current arc welder.

The process gives high-quality welds at high speeds and low cost. There is virtually no spraying or spattering, and there is no slag covering on the weld. It may be used on mild steels, with or without normal mill scale, on thicknesses from 1/16 inch up. The equipment is primarily intended for horizontal or flat position welding; it is not as presently developed practical for vertical or overhead applications.

In stabilizing the arc, the special coating of the MS-20 wire has a decided effect on the consumption of the argon shielding gas. This is because each time an arc fluctuates, air is drawn past the inert-gas shield, and consequently more gas is required to prevent induction of air. Where good arc stability is provided, these fluctuations are eliminated, resulting in a saving of the gas.

The electrode gun incorporates several advantages. Light in weight and well balanced, it allows the operator to weld for long periods without fatigue. No tubing is exposed on the gun, which delivers wire, power, gas, and water. The tip of the gun is specially designed for high water-cooling efficiency, meaning longer life.

The wire control consists of a two-roll gearmotor drive. Electrode length beyond the tip of the gun is controlled on stopping, so that neither wire nor operator time is wasted in trimming. Designed for portability, the control panel is lightweight and operates from 110-volt alternating-current supply. An adjustable switch prevents operation of the unit when water pressure is below a predetermined amount.

One advantage of the power supply is the relatively flat volt-ampere characteristic that it produces. The drop from no load to full load is only 6 volts, a feature which helps greatly in obtaining maximum arc stability, as well as assuring quick starting and recovery. No current adjustments are necessary at the welder, since it is automatically regulated by the rate that the wire is fed into the arc. Efficiency is about 82 per cent, and the power factor is in excess of 95 per cent at continuous rated load.

Seventieth Anniversary Celebrated by Cincinnati Milling Machine Co.

THE Seventieth Anniversary of the Cincinnati Milling Machine Co., Cincinnati, Ohio, is currently being celebrated with a series of open houses planned for customers. trade paper editors, industrial groups, and technical societies. A tour is conducted through the engineering and headquarters building, main plant, foundry, products division, and process machinery division. Since each tour extends over several miles, two motorpowered trains carry the visitors in comfort between plants and through the aisles of the foundry, products division, and heavy machining plant.

On the tour, the visitor is impressed with the modern re-

search and manufacturing facilities and is introduced to new products and advanced ideas that will enable machine tool users to reduce costs. Of contrasting interest is a reproduction of the original shop as it appeared in 1884, equipped with Cincinnati machines built then.



Frederick V. Geler, president of the Cincinnati Milling Machine Co. and son of the founder

Another highlight of the tour is a trip through the technical training center which includes shops, classrooms, interview rooms, an auditorium, and the Fred A. Geier Memorial Room. The training center and its facilities are completely new and provide a large increase in area over previous facilities for the twenty-one training courses that are given.

New products unveiled include a line of heavy-duty Hy-Powermatic milling machines, a Toolmaster milling machine, a No. 2 centerless grinder, and a No. 1 cutter and tool grinder. Some of these new machines are introduced in a novel circus atmosphere.

A sales skit and a motion picture "William Johnson and the Draggin," enliven the technical events of the day. The picture presents an animated approach to the replacement problem as it concerns both potential customers and sales representatives of machine tool builders.



New technical training center, which includes shops, classrooms, interview rooms, an auditorium, and the Fred A. Geier Memorial Room

INGENIOUS Mechanisms Selected

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Intermittent Motion Derived from Continuously Rotating Shaft

By L. KASPER, Philadelphia, Pa.

On a wire-forming machine, it was necessary to interrupt the feed of the wire at certain intervals in the cycle. To accomplish this, the shaft operating the feeding mechanism was cut at one point, and the mechanism illustrated was then installed.

As indicated in the drawing, shaft A, the driving member, transmits its motion to shaft B, which operates the feeding mechanism. Keyed to shaft A and rotating with it is a disc C. The disc carries a pawl D that is normally held in contact with a ratchet E by a spring F. Ratchet E rotates with shaft B. There are eight teeth spaced around the ratchet. A ring G, which is mounted on a sta-

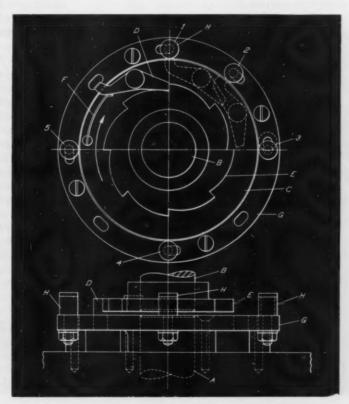
tionary part of the machine, is slotted at eight equally spaced points to receive studs carrying rollers H, which contact the tail of the pawl.

For purposes of explanation, the rollers H are numbered 1 to 5. As shaft A and disc C rotate in the direction indicated by the arrow, the pawl engages one of the teeth of the ratchet, causing shaft B to rotate in unison until the tail of the pawl contacts roller No. 1. The pawl at this and subsequent locations is represented in broken line. In contacting the roller, the pawl is released from the ratchet and the motion of shaft B is interrupted until the pawl again engages a ratchet tooth.

Assuming for the present that roller No. 2 has been removed, the movement of the ratchet again begins when the pawl engages ratchet tooth adjacent to roller No. 3. Thus far, shaft A has rotated 90 degrees, but shaft B has rotated only

45 degrees, the other 45 degrees having been lost by the pawl passing over one tooth of the ratchet. Continued movement of the disc causes the ratchet to again be rotated until the tail of the pawl contacts roller No. 3, when movement is once more interrupted. With rollers Nos. 1, 3, 4, and 5 positioned as shown, there are four movements of shaft B and four rest periods of 45 degrees each in every rotation of shaft A. On the machine involved, this was the particular intermittent motion required.

The design, moreover, lends itself to other variations. Assuming, for example, that roller No. 2 is placed as shown, the pawl is prevented from engaging the ratchet tooth. It will be noted that this roller has been moved to the upper end of its slot, the purpose being to operate the pawl before tooth engagement. If roller No. 3 were moved to the upper end of its slot, disengagement



The pawl (D) is disengaged from ratchet (E) by contact with one of the rollers (H).

would continue until the tooth adjacent to roller No. 4 is reached, thus producing a rest period of 135 degrees. Likewise, if roller No. 4 were transferred from its present position to the slot immediately to the right, engagement would again be prevented, producing a rest period for shaft B of 180 degrees.

It is evident that various combinations of intermittent motions can be obtained, depending on the number of rollers used and their locations. This mechanism can be adapted to a wide variety of intermittent motions by increasing the number of teeth in the ratchet and providing a continuous slot in ring G, so that rollers are able to be placed in any position.

Unidirectional Rotation Regardless of Changes in Drive Direction

By PAUL GRODZINSKI, London, England

Occasionally it is necessary to drive a shaft in only one direction even though the driving member may alter its own direction of rotation. In designing the drive mechanism for a recorder drum, such a situation did arise. The drum was required to maintain a single direction of rotation regardless of the fact that its driving member fluctuated between a clockwise and a counterclockwise movement.

A clutch and bevel gear arrangement, Fig. 1, answered the purpose. It consists basically of three bevel gears: gear A being the driven member, and gears B and C being the driving member.

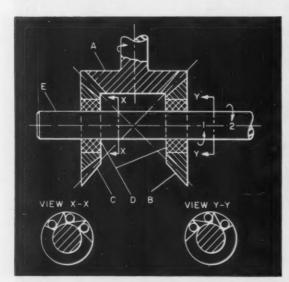


Fig. 1. Two bevel gears mounted on roller clutches (D) provide unidirectional rotation for driven gear (A) regardless of rotational direction of drive-shaft (E).

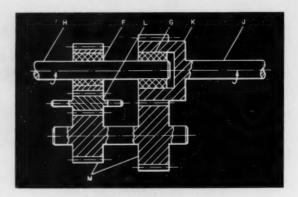


Fig. 2. Spur gear set-up designed to accomplish the same purpose as bevel gearing shown in Fig. 1

bers. Both driving gears are mounted on roller clutches D which are, in turn, mounted on a common drive-shaft E. The clutches provide positive drive when rotated in one direction, with overrun, or "free-wheeling," being the result of reverse rotation. Each of the two clutches in this set-up is mounted in opposite directions from one another; hence bevel gears B and C cannot drive in the same direction.

When the drive-shaft rotates in the direction indicated by Arrow 1 (at the right-hand end of drive-shaft), the clutch in gear B engages while the clutch in gear C slips, thus driving gear A as indicated. Upon reversal of the direction of drive-shaft rotation to that indicated by Arrow 2, the operation of the clutches is also reversed. In this way, the direction of gear A is unchanged.

A set-up employing spur gears to obtain the same end result may be seen in Fig. 2. Here again, two roller clutches F and G are mounted on common drive-shaft H. In line with this is driven shaft J, on the end of which is an integral external spur gear K. Gear K is counterbored to fit over the outside diameter of clutch G.

As the drive-shaft rotates in the direction indicated by the arrow, clutch F slips while clutch G engages, thus forcing the driven shaft to rotate as shown. When drive-shaft rotation is reversed, clutch F, which is mounted within the bore of a spur gear, engages as clutch G slips. Motion is transferred through idler gear L to intermediate gears M, and finally to driven gear K, thereby causing the direction of rotation of drive-shaft J to remain the same.

Copper Outlook

All three sources of domestic copper supply—namely mine production, net imports, and scrap—show promise of substantial increases. The potential surplus of copper may reach more than 500,000 tons by 1958.

TOOL ENGINEERING

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Special Chucking Machine Attachments for Milling Under-Cuts

Two attachments developed at the Ford Motor Co., Ltd., Dagenham, England, permit undercuts to be produced as a regular part of an automatic chucking machine cycle. The work-piece, a steel forging, is an intermediate shaft in the transmission of a Fordson tractor. One end of the forging is hub-shaped and is finished on a six-spindle Acme-Gridley automatic chucking machine to form two diameters, one for an internal gear and the other for a bearing. Several forgings can be seen in the view of the work-spindles, Fig. 1.

For the under-cut at the rear of the gear, the attachment in Fig. 2 is used. Specifications call for an under-cut diameter A of 3.88 inches with a maximum width of 0.19 inch. The cutter used for the operation is a twelve-tooth slitting saw B, which is 3.06 inches in diameter and 0.17 inch in width. The ball-bearing cutter-spindle C is mounted on a compound slide D. The base E of this slide is attached to the turret F of the end tool-slide. Driven through a universal-joint telescoping shaft G from a live spindle H, the cutter rotates at 30 surface feet per minute. With the work rotating in an opposing direction at 60 feet per minute, an actual speed of 90 feet per minute is obtained.

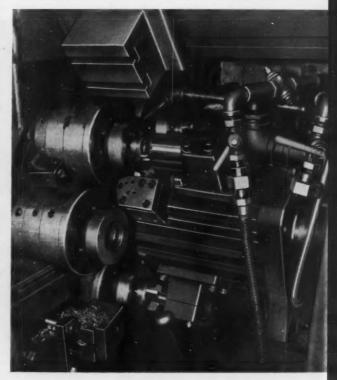
A stop-bar J is hinged to a bracket K fixed next to the live spindle. The bar runs through a lug L on the longitudinally moving member M of the compound slide, and is provided with locknuts N at its outer end. Between the lug and a shoulder on the bar is a compression spring O.

When the end tool-slide advances, member M travels as a unit with base E, moving the cutter into position in the bore, until limited by the setting of the stop-bar. Farther advance, for operations performed at other stations, is permitted by the independent movement of base E, against the pressure of a spring-loaded pin P.

Fig. 1. Close-up view of the Acme-Gridley automatic chucking machine, showing some of the tooling for the hub-shaped end of the shaft The radial feed then required to sink the cutter into the work is derived from the motion of the lower rear facing slide. Since the attachment is mounted on the rear vertical face of the turret (Station 4), the transversely moving member Q operates in a vertical plane.

Mounted on the lower rear slide is a rigid extension member, the upper end of which terminates in a hook-shaped cam-plate R. The cam-track slot in the plate engages a roller follower S secured to member Q. In this manner, the horizontal feed of the lower rear slide produces a radial feed of the cutter of 0.012 inch per revolution of the live spindle.

Another special attachment, Fig. 3, is employed at Station 5 for forming the semicircular under-cut T at the rear of the bearing surface. The position of the under-cut, which has a radius of 0.12 inch and a depth of 0.02 inch, necessitates feeding the form cutter U at 45 degrees to the



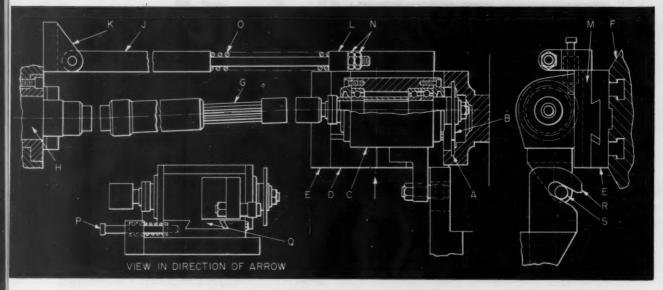


Fig. 2. A milling cutter is driven from a live spindle to under-cut the rear of the gear diameter.

The cutter travels with the turnet of the end tool-slide.

surface. This attachment is also mounted on the turret of the end tool-slide, and controlled by a stop-bar V.

The cutter is carried on a transverse slide W, having a follower pin X. A rectangular camplate Y is attached to the outer end of the bar and contained in a channel in the base Z.

Advance of the end tool-slide produces a longitudinal movement of the base relative to the sta-

tionary cam-plate. As the cutter approaches the work area, the follower pin rides against a 45-degree surface AA of the cam-plate. This action sets up a simultaneous movement of the transverse slide, so that the cutter enters the under-cut at the required angle. On the return of the end tool-slide, a compression spring BB causes the transverse slide to retract when the follower pin clears the 45-degree surface.

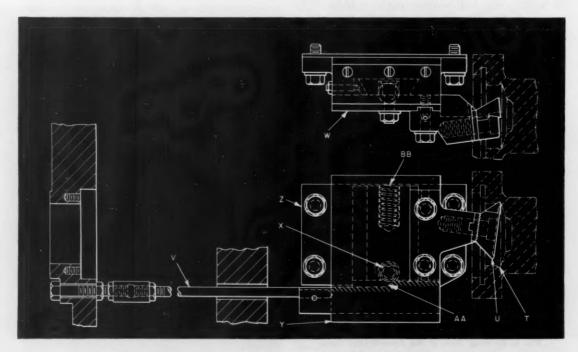


Fig. 3. Simultaneous movements of the attachment in coordinate directions produce the 45-degree under-cut at the rear of the bearing diameter.

Gage Checks Five Dimensions of Shaft Neck

By W. M. HALLIDAY, Southport, England

The necked area of a cylindrical shaft presented a gaging problem because of its peculiar shape and the number of critical dimensions that had to be checked. A special gage was designed which, in conjunction with a standard outside micrometer caliper, now checks the various dimensions. The illustration shows the gage in position over the shaft.

The neck consists of two bevels A and B, and a reduced concave band C that is separated from each bevel by short straight walls D. Bevels A and B are 40 and 45 degrees, respectively, from the shaft axis. The following dimensions are checked by the gage: (1) the diameter at the center of the band; (2) the distance a between the straight walls; (3) the distances b and c along the shaft axis from the outer corner of each bevel to the center of the band; and (4) the distance d, from the center of the band to a reduced diameter F at the right-hand end of the shaft.

Gage body G is tubular, being a close fit over the main diameter H and the reduced diameter F. When the gage is slipped on the work until it abuts against the shoulder J, it is secured by means of a thumb-screw K. At its left-hand end, the gage body is cut away to form a step, indicated by the broken line L.

A rectangular steel bar M is secured by capscrews N in a channel milled into the gage body and extends a short distance beyond the left-hand side of the neck. Three plungers Q, P, and R are contained in the bar. These plungers are accurately located laterally, it being especially impor-

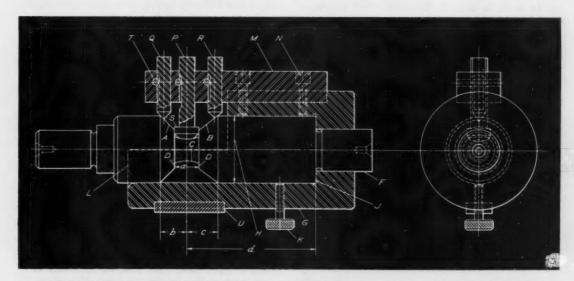
tant that plunger P is directly over the center of the band.

The lower end of plunger P is convex, matching the contour of the band, and an adjacent shoulder S has a diameter equal to the lower limit of distance a. Plungers Q and R have conical points, with included angles (90 and 100 degrees, respectively) corresponding to bevels A and B.

Cross-pins T intersect milled flats on each of the plungers, preventing their turning. These crosspins also serve to confine the vertical movement of the plungers. Thus they can be raised sufficiently to clear the neck without falling out of the bar, a procedure necessary when the gage is being removed from the work. Diametrically opposite bar M, a hardened, lapped measuring plate U is fixed in the outer surface of the gage body.

Initially, the gage is located over a master shaft having a neck of known correct dimensions. With the plungers lowered into contact with this neck, their upper ends are ground so that they are flat and are in the same plane. A reading from the top of the plungers to the measuring plate is made with a micrometer. The measurement is noted and serves as the standard for readings made with all actual work-pieces.

If in checking a particular shaft, shoulder S on plunger P cannot enter the area between the walls D, the band is either incorrectly located with respect to shoulder J, or distance a is too short. If the plunger is able to enter the area, the band diameter can then be checked by "miking" the distance from the top of plunger P to measuring plate U, and comparing this reading with the standard. Likewise, by "miking" and comparing the reading from the top of plungers Q and R to the plate with that of the standard, distances b and c can be checked.



By using three plungers with lower ends corresponding to shape of neck, this gage checks five dimensions.

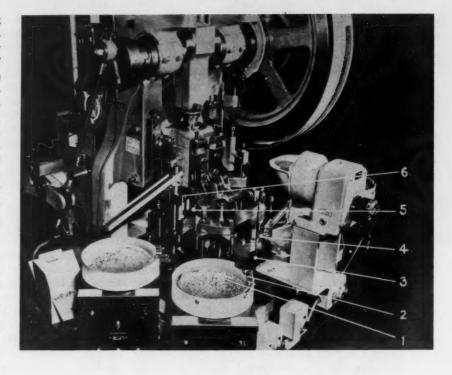
Automation Applied to Bearing Assembly

SMALL, low-cost ball thrust bearing is now automatically assembled at the rate of fifty-two units per minute at the New Departure Division of the General Motors Corporation, Bristol, Conn. The bearing has a 0.280-inch bore, an outside diameter of 17/32 inch, and a width of 0.228 inch. Its static load rating is 500 pounds, with a rating of 100 pounds at 500 R.P.M.

The accuracy requirements of this bearing are not as demanding as those of its high-precision counterparts, and accordingly, manufacturing costs must be proportionately lower. Assembling the bearing, traditionally the costliest phase of production be-

cause of the labor entailed, recently has become entirely automatic. This has been accomplished by assigning the operation to the V & O high-speed press illustrated in Fig. 1.

The machine has been equipped with an indexing dial around which six operations are grouped. Each of the six work stations is correspondingly identified in the illustration. The various stages in the build-up of the assembly can be seen in Fig. 2. The shell and two race rings are fed from vibrating magazines equipped with fixtures which automatically orient the parts in the correct assembly position. As the dial table indexes counter-clockwise, (1) the bearing shell is introduced open side up; (2) the first



race ring is placed ball race up in the shell; (3) a complement of balls is inserted and spraylubricated; (4) the second ring is placed ball race down in the shell; (5) the shell is preformed around the rings and balls; and (6) the shell is finish-formed for size and running clearance with the upper ring.

Throughout the operation, if any part is incorrectly presented at its station, or if it is off size or has suffered previous damage, a sensitive control stops the machine, and the part is removed. This feature prevents possible injury to tools and eliminates the loss of any machine time. Thus, through fully automatic operation and control, a high degree of uniformity is attained in the finished product, and the rejection of unsatisfactory components at each station assures the completion only of perfect bearings. As a final step, completed bearings are automatically counted into suitable lots and deposited in shipping containers.

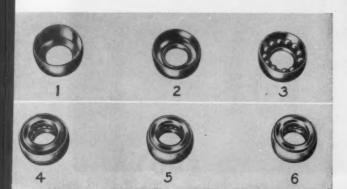


Fig. 1. (Above) The work stations are grouped around the dial table of the press, with the preforming and finish-forming of the shell directly beneath the ram.

Fig. 2. (Left) These views show the appearance of the work at each of the six stages of assembly.



Pills of Contentment

A N article entitled "The Pill's Grim Progress" in August Esquire has particular significance to numberless salesmen. It relates the causes behind the debilitating "epidemics" such as stomach ulcers, heart attacks, or only that constant tired feeling. These causes are all summed up in the word FEAR.

Worry, for instance, caused by the pressures of competitive politics within one's company.

Anxiety to acquire a higher status than fellow workers.

Dissatisfaction that results from expenseaccount living which warps one's sense of values and sets up a false standard resulting perhaps from filet mignon for lunch with the customer, and spaghetti for dinner with the wife.

Trepidation with regard to what superiors will think if we don't get that contract, instead of concentrating on it to the best of our ability, willy-nilly.

Interviews during the last few years with many successful sales engineers have revealed plenty of examples of growing fear. It has nothing to do with the techniques that mark skill in selling, but eventually undermines them. Yet every sales engineer can do well to heed these underlying causes in order to prevent this overpowering reason for failure.

We can find no better suggestion than to stress the importance of *balance* and *control* in connection with our business, social, and domestic behavior. As one author expresses it, right living is not an obedience to rule. It is balance, renewed each instant between tensions as a tightrope walker has learned to do.

Pressure on the individual multiplies when he is trying to respond to the demands of modern business and the needs of home, which lead him to desire above all else a doctor's prescription for "pills of contentment."

That this condition exists and is growing cannot be denied. Just examine the lives of an increasing number of salesmen, and if you gain their confidence and reach the cause for approaching failure, you find that they are harassed by hidden worries. Of course, there are plenty of salesmen today who are able to run their own job, rather than letting the job run them. They have balance and control.

It may be helpful to suggest ways in which balance and control can be developed:

Pick from the many things to do those things that are important and concentrate successively on them.

Carefully analyze any situation, then act. Expect some failures—no one can avoid some—but bury the losses.

Above all, do well what you do, so that attention is not continually being diverted by taking time out for backtracking.

Place limits on energy and time. Clip business off short when you reach those limits for periods of relaxation.

Don't carry business pressures into your home or personal friendships.

Develop an attitude of tolerance to your business associates. We may see others of less ability and integrity advanced, but we learn to recognize that time has its answer in spite of temporary irritating setbacks.

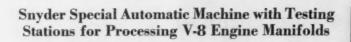
Adopt outside interests on which to periodically concentrate, and thereby acquire a sound philosophy toward life that includes something more than a horse chase for the dollar prize.

One veteran sales engineer, who has learned to both concoct and consume his own "pills of contentment," exclaimed to me: "Sure, I go off the handle like everyone else now and then, but I go off gently, so as not to come to with a cracked skull."

Man can actually make his own "pills of contentment" without hounding the doctor for them. Only be determined to carefully select and mix the two ingredients—balance and control—then take these pills regularly three times a day!

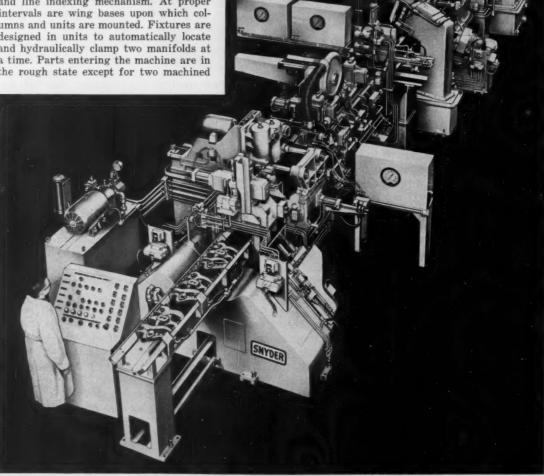
LATEST DEVELOPMENTS

Shop



Automatic testing is one of several unusual features incorporated in a twenty-one-station, line indexing machine intro-

duced by the Snyder Tool and Engineering Co., Detroit, Mich. This special automatic cycle machine is designed for processing the intake manifold of a V-8 automotive engine. It consists essentially of a series of in-line bases which support the fixture and line indexing mechanism. At proper intervals are wing bases upon which columns and units are mounted. Fixtures are designed in units to automatically locate and hydraulically clamp two manifolds at a time. Parts entering the machine are in the rough state except for two machined



Special automatic line indexing machine for processing intake manifolds has been introduced by the Snyder Tool & Engineering Co.

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

faces that fit against the cylinder heads. The included angle between these two faces is 90 degrees. In all operations performed on this machine, the part rests upon these two faces.

At Stations 5, 6, 7, 8, and 9, the passages or channels through the part are automatically tested for leakage and for proper volume of air flow. Testing for leakage is accomplished by sealing all of the manifold outlets, injecting compressed air, and measuring the pressure drop over a fixed period of time. Openings are sealed by means of steel pads to which neoprene sheets have been vulcanized and which are held tightly against the part by hydraulic cylinders, the part being tightly clamped during the testing operations.

Testing for air volume flow is done by blowing the required volume of air through the manifold passages. Any restriction in air passage is then detected through a rise in pressure, indicated on a gage at the inlet.

If a part is faulty because of improper air flow, it is marked by a solenoid-operated punch which identifies it as a reject at Station 9 and indicates the reason for rejection.

If a part is found to be faulty in any of the tests at Stations 5, 6, 7, or 8, a mechanical memory device is activated which causes the part to be rejected when it reaches Station 9. It also causes a repaired part to be moved into the line to replace the rejected part.

Another interesting feature is an inspection operation at Station 18. This operation consists of checks to insure that all holes to be tapped are drilled before the part enters Station 19.

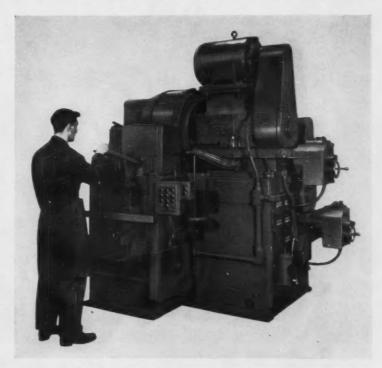
The work is axially located in the first station by three coneshaped jaws which contact the outer surface of the water inlet boss located in the upper face of the part. Four holes are drilled in the left- and right-hand flanges of the head mating faces, and in the right-hand side two of these holes are reamed to serve as locating holes for the remaining operations. A total of twenty-nine holes is processed as the part moves through the machine. The part thus handled is completely machined when it reaches the unloading station. Operations include milling, reaming, drilling, core-drilling, and tapping.

At Station 20, a choke heater tube is inserted and pressed into place by means of a hopper and feed mechanism. Operation of machine is automatic after loading (except for unloading and reloading at Station 9). The machine may be operated by unskilled help. An electrical interlock system protects both the operator and the machine. Production is at the rate of 130 pieces an hour at an operating efficiency of 80 per cent.

Circle Item 101 on postcard, page 265

Gardner Horizontal Spindle Two-Head Grinder

A special high-production twohead grinder for grinding the closed end of automotive valve tappets has been developed by the Gardner Machine Co., Beloit, Wis. A heavy welded-steel base supports the two grinding head slides upon dovetailed ways. Hardened



Horizontal spindle two-head grinder announced by the Gardner Machine Co.

and ground steel plates serve as races for precision-sized ball bearings to insure easy movement of each grinding head on its ball-bearing ways. A double roller type bearing takes the radial load, and two ball thrust bearings carry the thrust load. The heads can be pivoted to provide for angular adjustment of the grinding wheel.

Each grinding head slide is provided with automatic feed, but can also be operated manually. A caliper on the head registers on the ground surface and causes the head to be fed in a predetermined amount when too little stock is being removed. Counterweights serve to hold each head against an adjustable stop. A power-operated swinging dresser employing ballbearing cutters is provided for each head. The dressers are enclosed within the head.

A rotary work-carrier of the V-

notch type operated through a Vari-speed drive unit permits speed adjustments within a 3 to 1 ratio. A chain hold-down attachment keeps the tappets in the V-notches of the carrier during the grinding operation. An inclined trough into which the tappets are stacked permits the work-carrier

to pick up these parts one at a time as it revolves. The carriers are unloaded by gravity. Production is at the rate of 2400 tappets per hour, based on a maximum stock removal of 0.028 to 0.038 inch. Work tolerances are held within 0.002 inch.

Circle Item 102 on postcard, page 265

Motch & Merryweather Floor Type Milling Machine

A heavy-duty floor type milling machine designed for use in conjunction with special milling equipment on M-48 tank hull production work has been built by the Motch & Merryweather Machinery Co., Cleveland, Ohio. The bed of this unit is a heavy, normalized steel fabricated member on which large cast-iron ways have been mounted. These ways carry the saddle, upon which is mounted a housing having vertical

ways which support the horizontal spindle milling head.

Hydraulic cylinders are provided to feed the saddle at a variable rate on the main bed. The housing is positioned hydraulically on the ways provided on the saddle. A barrel type multiple stop is supplied for accurate positioning of the housing. Vertical feeding of the milling head in either direction is obtained hydraulically. All sliding way surfaces have non-metallic liners.

The milling head is a single-speed type with additional speeds available through change-gears. A 75-H.P. motor drives the milling head through a multiple V-belt and large bull gear which imparts a flywheel action to the spindle. The quill has an adjustment of 2 inches to provide for cutter positioning and wear.

Each individual moving unit of the machine has hydraulically actuated power clamping with an interlock to prevent movement until the operator releases the clamp. Automatic pressure lubrication is provided for all contact surfaces and bearing points.

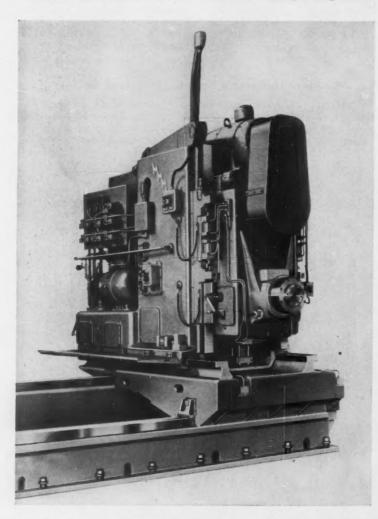
Circle Item 103 on postcard, page 265

Jetweld Electrode for High Tensile Strength Joints

An electrode, called Jetweld 2HT, for welding high tensile strength joints has been brought out by the Lincoln Electric Co., Cleveland, Ohio. This electrode contains iron powder in the coating and is designed for high-speed, low-cost welding of flat fillet and deep groove joints.

Easy slag removal and smooth appearance of welds are advantages claimed for this electrode. A stress-relieved weld has a tensile strength of 76,700 pounds per square inch, a yield strength of 64,300 pounds per square inch, and an elongation of 27 per cent. The electrode is now available in one size, 7/32-inch in diameter.

Circle Item 104 on postcard, page 265



Heavy-duty floor type milling machine brought out by Motch & Merryweather

Machine for Processing Transmission Cases

A special eight-way, six-station, center-column type multiple-spindle machine with hydraulic feed has been brought out by the Buhr Machine Tool Co., Ann Arbor, Mich., for processing transmission cases. This machine features a three-spindle power wrench with individual torque control for actuating the fixture clamping mechanism and a movable bushing plate. The 72-inch automatic index-table is power-operated, and has a detachable indexing unit.

Besides drilling, reaming, and counterboring, this machine also performs a face-milling operation which is accomplished with a specially designed generating tool. Features include complete interchangeability of parts, hardenedand-ground laminated tool-steel ways, and automatic lubrication. Hydraulic and electrical installations are designed to J.I.C. standards. Production is at the rate of 90 pieces per hour.

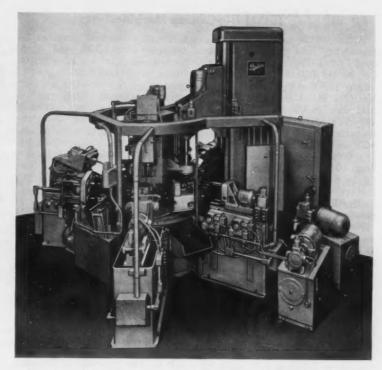
Circle Item 105 on postcard, page 265

Special Machine for Broaching Kingpin Holes in Front Axles

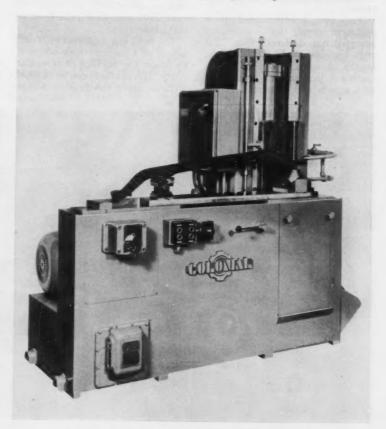
Kingpin holes in the front axles for automobiles are now being broached rapidly and accurately on a special broaching machine, equipped with a simple fixture, which was built by the Colonial Broach Co., Detroit, Mich. The fixture, as shown in the illustration, supports the I-beam section of the axle during the broaching operation. The broaching machine is a vertical pull-down type having a capacity of 6 tons and a stroke of 24 inches.

The axle to be broached is supported by two sections of the fixture. No clamp is used, the downward pressure of the smooth-cutting broach as it is pulled through the work being sufficient to hold the axle securely and accurately in the fixture during the working stroke. The operator simply lowers the axle into the fixture until the mounting pad rests on a support block and then uses the broaching tool to align the kingpin hole with the locating hole in the fixture. The kingpin holes in the forged steel I-beam axles are broached to a diameter of 0.922 inch for a length of 2.435 inches from rough holes 0.906 inch in diameter.

Circle Item 106 on postcard, page 265



Machine built by Buhr Machine Tool Co. for processing transmission cases



Colonial special broaching machine equipped for broaching kingpin holes in automobile axles

H-P-M Die-Casting Machines

A line of die-casting machines embodying new features, developed by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, is being shown for the first time at the National Metal Exposition being held this month in Chicago. A 400-ton model will be in dry-cycle operation. Cold chamber models with capacities ranging from 200 to 1000 tons and gooseneck models from 100 to 600 tons are included in the line. The exhibit will also feature the new H-P-M line of hydraulic components, including pumps and motors, cylinders, valves, power units, and circuit accessories.

A combination of hydraulic power and simple mechanical linkage is said to give the clamp developed for the new die-casting machines a smooth, precisely controlled clamping action that limits dimensional elongation or compression and prevents die blow on overloads or off-center loads. Automatic lubrication employing molydisulphide lubricants is used to resist friction over large contact areas.

The new injection end is a packaged power unit, including pump, motor, and reservoir. This unit was designed to reduce line breaks or leaks, inherent in diecasting injection ends because of high speeds and pressures. It has

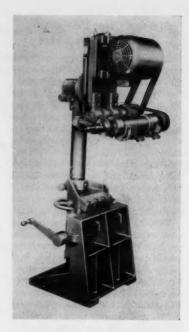
a special valve that provides for variable acceleration and speed control of the metal plunger. Other advantages include ease of positioning, accessibility for servicing, constant and positive plunger movement, and maximum speeds required for all die-casting alloys, including aluminum and magnesium. All high-pressure hydraulic units are manifolded for compactness, elimination of line breaks, and greater safety.

Circle Item 107 on postcard, page 265

Hammond Polishing-Buffing Head and Stand Unit

Hammond Machinery Builders, Inc., Kalamazoo, Mich., have recently added a polishing-buffing head and stand unit to their line of metal-finishing machinery. The Model 50-99 head unit is driven by a 3-, 5-, or 7 1/2-H.P. motor having a speed of 1750 R.P.M. or a 10-H.P. motor operating at 3500 R.P.M. The machine is intended for medium-duty polishing and buffing operations. Its weight of over 1400 pounds is said to eliminate vibration.

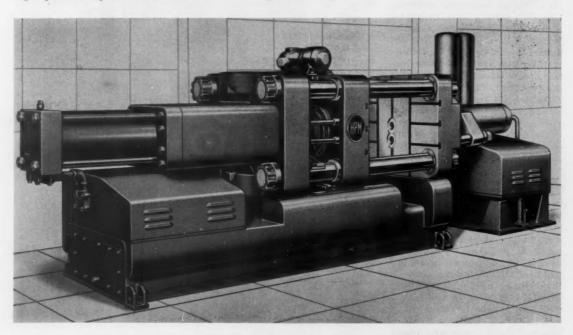
The head has a maximum "float" action of 4 inches which allows it to follow the surface of irregular parts. Flat surfaces can be finished without using the floating action.



New polishing and buffing unit announced by Hammond Machinery Builders, Inc.

Power wheel feed can be furnished, to maintain the correct pressure required for uniform results. Periodic reading of the ammeter furnished as standard equipment also assists in maintaining a uniform finish.

Circle Item 108 on postcard, page 265



Die-casting machine of improved design introduced at the National Metal Exposition by the Hydraulic Press Mfg. Co.

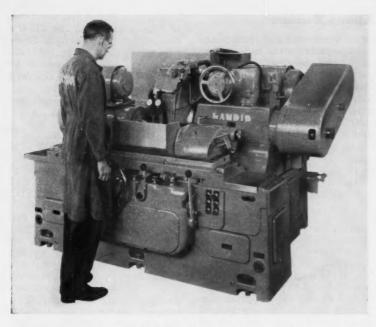


Fig. 1. Landis plain hydraulic grinding machine equipped to grind two diameters of propeller shaft sleeve, removing 0.020 inch of stock

Landis Plain Cylindrical Grinder

A series of plain hydraulic precision cylindrical grinders for finishing parts requiring the use of wide wheels or wheels of large diameter has been developed by the Landis Tool Co., Waynesboro, Pa. Wheels up to 10 inches in width can be used on this machine for infeed grinding operations. Spaced wheels having a combined width of up to 10 inches can be employed for multiple-diameter or profile grinding. Wheels up to 36 inches in diameter can be used for some work-pieces that require large wheels to provide clearance for webs.

The grinders are made in both 10- and 14-inch swing capacities. Both the 10-inch machine, designated Type DCH, and the 14-inch, designated Type LDCH, are made in center-to-center lengths of 18, 36, 48, 72, 96, and 120 inches. Longer lengths are made on special orders.

A heavy-duty wheel-head with a large spindle takes heavy grinding loads. Movement of a single lever causes the hydraulic feed to traverse the grinding wheel rapidly into the grinding position. A slow feed moves the wheel-head, during grinding, to a predetermined stop position. After sparkout, the wheel-head returns rapidly to the back position to begin a new cycle. Hand feed with both coarse and fine adjustments is

standard equipment. The grinding wheel is driven by a 25-H.P. motor.

The work-head is powered by a 1 1/2-H.P. motor. Spindles in the work-head and footstock are made extra heavy. The work-table may be moved by either a two-speed hand traverse arrangement or by

hydraulic power. The speed of the hydraulic traverse is variable by dial control and provision is made to obtain an adjustable dwell.

Wheel-spindle lubrication is automatic. An interlock prevents spindle rotation until pressure is built up in the filtered oil lubricating system. In the event that pressure should fail, the spindle-drive motor will automatically stop. Flat- and V-ways for the wheel-head and carriage are also pressure lubricated by filtered oil. The machine bed contains reservoirs for hydraulic oil, lubricating oil, and coolant. Cast pockets are provided for leveling screws.

Circle Item 109 on postcard, page 265

"Twill" Twist Drills of New High-Speed Steel

The Pyramid Drill Co., Brookline, Boston, Mass., a division of the Pyramid Screen Co., Brighton, Mass., has announced a new super high-speed steel twist drill known as "Twill." The material from which the drills in this line are made has been selected to minimize embrittlement and assure faster drilling, longer life, and improved quality of the product. Special drills are available for drilling stainless steel of any grade, aluminum, brass, plastics, steel, and various other materials.

Circle Item 110 on postcard, page 265

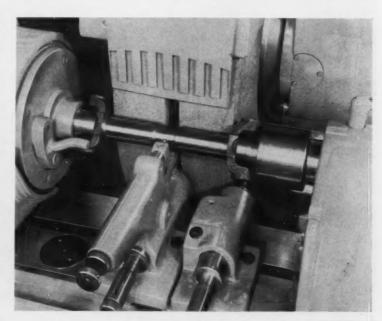


Fig. 2. Close-up view of work being ground on machine shown in Fig. 1 at a production rate of 190 pieces an hour

Waltham Thread Milling Machine

The Waltham Machine Works, Inc., Waltham, Mass., have recently modified the design of their thread milling machines to increase their operating value and improve appearance. The welded pedestal has been changed so that there is no need for access to the rear side once the machine is installed. This makes possible placement near a wall or partition, or of a battery of machines back to back.

The motor control box inside the pedestal, on the back wall, is operated by a push-button station on the front of the machine. At the right of the control box is a motor-driven coolant pump and tank that is easily removable for cleaning. At the left is the motor that drives the work-head. This can be raised and made stationary for shifting the belt on the two-step driving cone pulleys by means of a lever extending through the left side of the pedestal.

In the work-head, the speed of the spindle is further regulated by covered pick-off gears. With the gears furnished, eleven speeds between 0.5 and 5.75 R.P.M. can be obtained. These gears have the same dimensions and pitch as the change-gears for the lead-screw so that additional speeds may be obtained in some cases. The newly designed chip screening tray is removable from the front of the machine. The stop-rod and dogs are now placed in the front of the bed to allow easier access.

Circle Item 111 on postcard, page 265

Steelweld High-Production Deep-Draw Presses

A line of Steelweld "Hi-Draw" presses for high-production deepdraw work is being introduced by the Steelweld Machinery Division, Cleveland Crane & Engineering Co., Wickliffe, Ohio. The machines are designed to operate at high speeds during the non-productive portion of the ram stroke and at a slower, correct drawing speed during the working part of the stroke. This is accomplished through a newly developed linkage that provides quick approach, quick return, and slow constant velocity throughout the drawing range.

These presses are available in

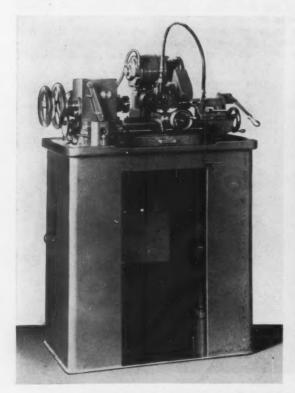
single- or double-action, one-, two-, or four-point types. The 215-ton single-point, single-action, Steel-weld "Hi-Draw" press with die cushion illustrated is set up to make parts requiring a 7-inch deep draw in one operation.

Circle Item 112 on postcard, page 265

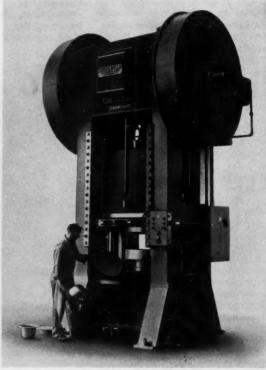
Precision Electrical Discharge Machine

A precision electrical discharge machine tool, designated the M-500, has been designed by the Elox Corporation, Clawson, Mich., and the Cincinnati Milling Machine Co., Cincinnati, Ohio. This machine has been developed for specific machining work by the electrical discharge process. It will be shown in continuous operation at the National Metal Exposition. Accuracy, ruggedness, and flexibility of adjustment are outstanding features claimed for this equipment. The lapped-in quill with a 9 1/2-inch travel is especially adapted for use in producing precision dies with deep cavities.

A dual coolant supply, consisting of a high-pressure pump and a separate high-capacity pump, provides for quick filling of the oil



Waltham thread milling machine of improved design



"Hi-Draw" press introduced by Steelweld



Precision electrical discharge machine and electronic power pack designed by the Elox Corporation and the Cincinnati Milling Machine Co.

reservoir. The work-pan mounting is designed to permit the use of the entire table area, which is 10 by 42 inches. An insulated bolster

plate, 9 by 15 inches, is movable over this surface. Micrometer adjustments are provided for longitudinal, transverse, and vertical feeds. The oil reservoir and pumps are mounted within the base and have slides to facilitate removal for cleaning and maintenance.

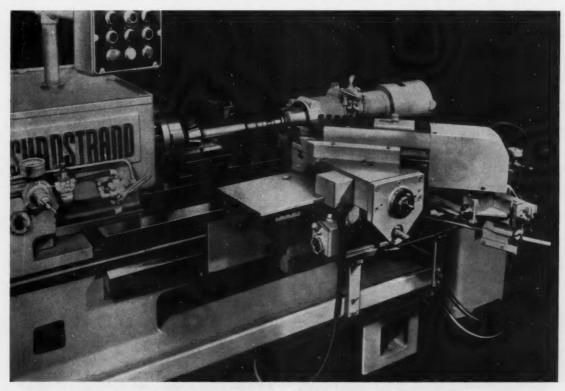
Circle Item 113 on postcard, page 265

Tracer Control for Sundstrand Lathes

Automatic lathes built by the Sundstrand Machine Tool Co., Rockford, Ill., can be provided with a new template-controlled tracing slide held on the regular front carriage. Thus the lathe can be used for multiple-cycle single-point turning of irregular shapes. Rough, semi-finish, and finish cuts can be taken with one turning tool in a single automatic cycle. Only one template is required for all three cuts.

The machine can be set up for one, two, or three cycles, depending on job requirements. The regular cross-feeding rear slide can be used for squaring up shoulders and chamfering. Cycle changing requires five to fifteen minutes, depending on the job and number of facing tools to be set up. This attachment is available for factory installation only on new Sundstrand automatic lathes.

Circle Item 114 on postcard, page 265



New Sundstrand automatic lathe equipped with multiple-cycle tracer control

Bryant Thread Gage

The Bryant Chucking Grinder Co., Springfield, Vt., is introducing a Model 21 bench gage designed to provide an accurate means for checking threads in all tolerance classes. It will gage internal threads in size ranging from 5/16 inch to 5 inches in diameter and external threads from No. 8 size to 5 inches in diameter. A pair of threaded segments comparable to a split ring thread gage provides the gaging contacts for external threads. Segments similar to a split plug thread gage are used for internal threads. Contact segments are interchangeable on the basic gage to cover the range of thread diameters.

Both "go form" and "pitch diameter" segments are available with the bench gage. The "go form" segments provide for a reading of the pitch diameter and indicate variations in thread form and lead, thus determining the fitness of the threaded part for assembly with its mating member. The "pitch diameter" segments provide a measurement of pitch diameter only. The segments are made to Class W tolerances and can be used to check all classes of thread tolerance. The gage mech-

anism can easily be changed to internal or external thread checking positions. The gage weighs approximately 10 pounds and occupies a bench space 6 by 9 inches.

A new attachment is available for use with the Model 21 in checking internal and external threads. This attachment measures the squareness of the face in relation to the axis of a thread. Both overand under-faces can be checked. The attachment is adjustable to accommodate face diameters from 1/4 inch up to 7 inches. It permits simultaneous readings of thread size as well as face run-out.

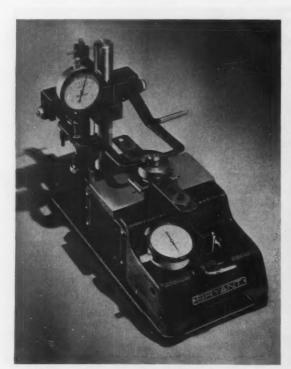
The attachment includes a base upon which the bench gage can be quickly mounted. The base also supports a post and adjustable bracket for two floating arms which follow the contour of the surface being checked. One arm contacts a dial indicator that shows variations in the surface of the part being checked. The second arm raises or lowers the indicator with the thread of the part being checked, regardless of face runout. The indicator gives a direct reading of the total face run-out with the thread axis.

Circle Item 115 on postcard, page 265

Automatic Single-Spindle Screw Machine

The Gear Grinding Machine Co., Detroit, Mich., is introducing an automatic single-spindle screw machine called the "Screwmatic 750." This machine has three outstanding features. The first is the infinitely variable-spindle speed drive. On the standard machine this permits a maximum spindle speed of 5100 R.P.M. Higher speeds are, however, available. The variable-speed drive makes it possible to take advantage of the higher speeds recommended for machining brass and aluminum, as well as carbide tooling. Also important is the provision for selecting any one of three different spindle speeds during a work cycle. Speeds are controlled by a simple dial setting and are adjustable during actual cutting operations. Reversibility of all forward speeds eliminates the need for left-hand tools. Smooth activation is accomplished by air pressure.

The second outstanding feature is the V-belt work-spindle drive. An independently supported V-belt sheave drives the spindle by means of a clearance spline arrangement. Greater forming preci-



Bench gage for checking internal and external threads introduced by Bryant Chucking Grinder Co.



Automatic single-spindle screw machine being introduced by the Gear Grinding Machine Co.

sion is said to be assured because the anti-friction spindle bearings carry cutting tool pressures only. The spindle carries no drag from drive members or clutch bodies.

Chatterproof forming is assured by the heavy-section cross-slides guided on vertically arranged dovetails. The slides are direct cam-actuated with micrometer adjustment and have concealed dead stops. Accurate forming is also assured by precision tool alignment with the work-spindle. The six-station turret is held in precision needle bearings and locked in hardened taper bushings. The machine uses standard turret tools 0.750 inch in diameter.

The third feature of special interest is the stock feed operated by low-pressure air cylinders instead of a constant-speed backshaft. Work-length capacity is also a notable feature of the machine. The standard size collets and feeders will take bar stock up to 0.750 inch in diameter. Stock lengths up to 2 1/4 inches are turned with a standard 7-inch cam, and lengths up to 6 inches can be turned by using larger cams.

The turret-slide is equipped for three-position crank setting and the turret index drive has three speeds. Camshaft cycle speeds range from 1.8 to 240 seconds. Provisions have been made to accommodate all commonly used attachments. Simplified forms of the machine can be supplied for longrun production of simple parts. A plain tool-slide can be substituted for the turret-slide and the spindle can be driven by an electric motor over V-belt sheaves instead of by the variable-speed drive.

Circle Item 116 on postcard, page 265

Greer Testing Machine for Hydraulic Accessories

The development of a low-cost machine for general industrial and maintenance testing of hydraulic accessories is announced by Greer Hydraulies, Inc, Jamaica, N. Y. This stationary hydraulic testing machine, known as the Model JK-100, may be used to test the performance and operating characteristics of aircraft or industrial hydraulic accessories, such as valves, actuating cylinders, and pressure regulators, operating at pressures up to 3000 pounds per square inch and flow volumes up to 6 gallons per minute.

The machine controls the temperature of the oil by means of a thermostatically actuated water cooling circuit, and the flow by means of a flow control valve. Precision measurement of flow and pressure is by means of accurate Rotometer type flow indicator and pressure gages. The pump is driven by a 15-H.P. motor.

Circle Item 117 on postcard, page 265

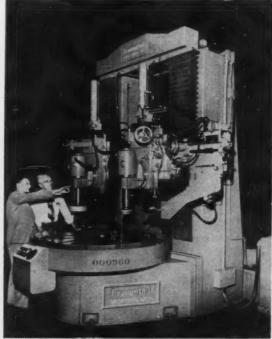
Frauenthal Double-Spindle Vertical Grinder

The Frauenthal Division, Kaydon Engineering Corporation, Muskegon, Mich., has built a double-spindle, vertical grinding machine for use in grinding blade retention raceways in the hubs of Turbo-Hydromatic propellers. This machine was designed to facilitate grinding large hubs in the vertical position since the weight and mass of the hub and fixture rendered conventional methods impractical.

Accuracy to within 0.0002 inch on diameters, vertical center distances, and concentricity of ground surfaces are said to be readily obtainable with this machine. Unique hydraulically actuated contourforming wheel dressers and a turret stop device to control raceway positioning are included in the special equipment. All compound movements—reciprocating, feed, and rapid-traverse positioning—



Hydraulic accessories testing machine which has been designed by Greer Hydraulics, Inc.



Vertical grinding machine built by Frauenthal Division of the Kaydon Engineering Corporation

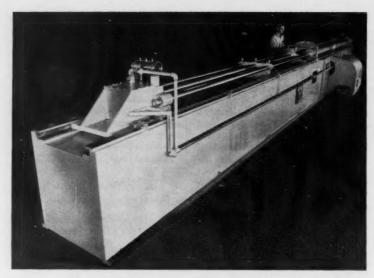
are hydraulically actuated. This is the largest floor-mounted machine built by the manufacturer and is said to be especially suited to toolroom applications.

Circle Item 118 on postcard, page 265

Sheffield Cylinder Bore Gaging Machine

Two engine blocks per minute can be handled on an automotive cylinder bore gaging and classifying machine designed and manufactured by the Sheffield Corporation, Dayton, Ohio. The machine shown simultaneously measures and classifies bore diameters in a six-cylinder engine block, inspecting for out-of-roundness and taper, and stamping the data for each bore on the block.

Bores are divided into ten classes with a difference of 0.0003 inch in diameter between each class. Classifying bore diameters in this manner permits selective matching of pistons to bores during assembly. A faulty bore is in-



Acme broaching machine for rifling cannon barrels

dicated by a red light, and upon detection the gaging cycle automatically stops.

Circle Item 119 on postcard, page 265



Cylinder bore gaging machine manufactured by Sheffield Corporation

Acme Hydraulic Broaching Machine for Rifling Cannon Barrels

The Acme Broach Corporation, Milan, Mich., has designed and built a hydraulic broaching machine for producing helical rifling grooves in 76-millimeter cannon barrels. These cannon barrels are approximately 15 feet long, and each must have the grooves cut in the bore for about 13 feet of its length.

The barrel is received and clamped by means of two split receiver bushings at the far end of the machine. When ready for the broaching operation, the barrel is positioned between the hydraulic cylinders seen in the illustration at the far end of the machine. The over-all length of the machine is approximately 45 feet. Double cylinders as well as pistons and pull-rods are used to provide a smooth acting drive for the spiral lead bar, which is the center bar of the three bars visible at the near end of the machine. The two outside bars are pull-bars which serve to draw the sliding head of the machine through the work cutting stroke with a powerful uniformly smooth action.

An intermediate support slide carries the drive-pin used for rotating the helical bar and rifling head. Cutting oil is supplied at high pressure to the rifling cutters and automatic lubrication is provided for the ways and sliding members.

Circle Item 120 on postcard, page 265



Vertical milling machine which has been improved by the U. S. Burke Machine Tool Division

Vertical Milling Machine

A vertical milling machine incorporating several improvements has been announced by the U.S. Burke Machine Tool Division, Cincinnati, Ohio. The vertical feed handle has been relocated, and a micrometer dial has been added to give accurate indication of the table setting or movement. This balanced head type milling machine has a hard chromium-plated quill which is carried in the precision-bored and honed head. A new draw-bar is said to speed up tool changing and also protect the tools. Tightening or loosening a single nut sets or releases tools from the spindle taper without danger of dropping them.

include Optional accessories hardened and ground lead-screws guaranteed to have a combined maximum run-out over the entire length of not more than 0.0005 inch and a longitudinal power table feed which is instantly reversible and infinitely variable between 0 and 12 inches per minute while in operation. When coolant is to be used, a coolant tank is installed in the machine pedestal. The table is 9 1/2 by 36 inches, and has a longitudinal feed of 24 inches, a cross-feed of 9 3/4 inches, and a vertical feed of 16 1/2 inches. A 1-H.P. motor with a speed of 1200 R.P.M. gives six standard spindle speeds ranging from 250 to 2850 R.P.M.

Circle Item 121 on postcard, page 265

Eccentric Geared Presses for Large Heavy Work

Straight-side eccentric geared presses, designed to handle a wide range of large, heavy-tonnage drawing, punching, and blanking work, have been brought out by the Niagara Machine & Tool Works, Buffalo, N. Y. Two of these series SE presses, are shown in Figs. 1 and 2. They are made with one-, two-, and four-point suspension, covering a range of 100- through 1000-ton capacities, and have large die areas and long strokes. These features make the presses well adapted for deepdrawing jobs in which work is engaged high up on the stroke and the bottom of the stroke is used for blanking and punching.

The eccentric is an integral part of the main gear (or gears) which rotates on a stationary pin rigidly supported in the crown, close to the point at which the pressure is exerted. The stationary pin, serving merely as a pivot, carries no torsional load and relatively little bending load. The frames are of all-steel, four-piece, tie-rod construction designed for strength and rigidity. The low-inertia,

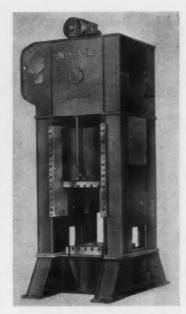


Fig. 1. Niagara eccentric geared press for heavy work, the smaller in new line

pneumatic friction clutch is so designed that most of the heavy members of the clutch continue to rotate with the flywheel. As only

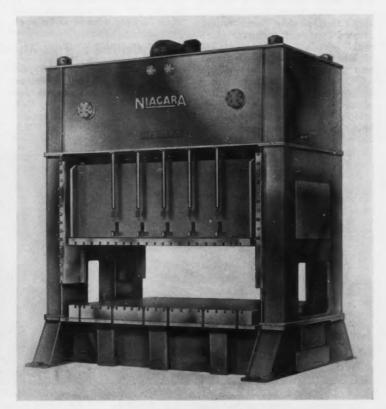


Fig. 2. Larger size Niagara eccentric geared press

the drive-shaft and driving plate start and stop with each cycle, heat and wear are greatly reduced. The entire driving assembly is housed in the crown. The operating controls have been developed to provide maximum protection for the die setter, operator, and the press itself.

Circle Item 122 on postcard, page 265

Michigan Three-Way Gear Classifier

The Michigan Tool Co., Detroit, Mich., has added a three-way gear classifier to its line of equipment designed to provide automatic control over the sizing of mass-produced gears. This classifier separates gears into acceptable, salvageable, and non-salvageable categories. The classification may be based on any one or a combination of the following conditions: under size, over size, correct size, eccentricity, and plus or minus helix angle.

The conveyor model has been developed to handle wide-face and cluster gears. Gears enter the classifier from the left side on a continuous belt conveyor with the gear face perpendicular to the line of travel. In the model illustrated, the helical production gears are rotated between two master gears —the driving gear, which is rigidly mounted and consists of two face sections 5/16 inch in width, and the driven gear, which is pivotally mounted and has a single face section of the same width. One of the advantages of this sectional master gear design

is the ease with which it meshes with the incoming gears.

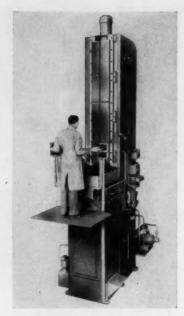
If the production gears meet the size specifications, they are carried along until they are unloaded at the end of the conveyor. Should any one of the disqualifying conditions exist in a gear, the master gears provide the signal source that actuates the corresponding rejection gate, and the gear is swept into the salvageable or non-salvageable chute.

Circle Item 123 on postcard, page 265

Vertical Hydraulic Surface Broaching Machine

The American Broach & Machine Co., Ann Arbor, Mich., has announced a vertical hydraulic surface broaching machine with 90-inch stroke and 15-ton work capacity. This machine was developed to meet the rugged requirements and precision tolerances encountered in surface broaching alloy metal parts for jet engines, but it is also suitable for other surface broaching applications.

The machine can be supplied as a single or dual ram unit. The single ram unit illustrated has a variable broaching speed of 5 to 30 feet per minute, return speed of 60 feet per minute, and a work



Broaching machine built by American Broach & Machine Co. for machining jet-engine parts

height capacity of about 9 feet. Over-all height of the machine is 19 feet. It requires a floor space 6 by 12 feet and weighs approximately 30,000 pounds.

Circle Item 124 on postcard, page 265

General Electric Alternating-Current Welders

A line of industrial welders, designed for high-speed production and low maintenance costs has just been announced by the General Electric Co., Schenectady, N. Y. This line consists of NEMA-

rated 300-, 400-, and 500-ampere models. The welders have stepless current control, silicone insulation, and aluminum coil windings. They are equipped with a large current scale which the operator



Conveyor type three-way gear classifier brought out by the Michigan Tool Co.



Alternating-current welder of line recently announced by the General Electric Co.

can read from a considerable distance. Fingertip current adjustment and quiet operation are made possible by having the coil supports float in a rubber bushing.

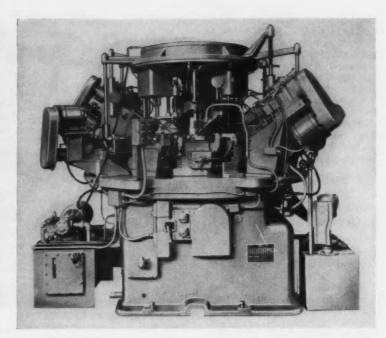
Highly accurate current settings are made possible by the moving primary coil design and the large current scale which has wider calibrations in the lower ranges. Current adjustments are accomplished by raising and lowering the primary coil. The simplicity of this design is said to result in a minimum of vibration and mechanical wear, and in easy maintenance. Wide current ranges permit the welders to be used on practically all industrial applications ranging from light-duty, low-current to heavy-duty, highcurrent welding jobs.

An automatic hot start arrangement provides an extra surge of current for easier starting. Other features include arc stabilizing capacitors, power-factor capacitors, a primary switch, and an "idlematic" control. The new welders are available for 220- to 440- or 500-volt operation.

Circle Item 125 on postcard, page 265

Rockwell Drill Units with Sliding Sub-Bases

The Drill Unit Division, Rockwell Mfg. Co., Pittsburgh, Pa., has introduced a line of sliding subbases designed to increase the versatility of its standard air-hydraulic drill units. There are three bases, one for each size unit. Use



Machine built by Morris Machine Tool Co. for processing carburetor part

of these bases makes it possible for special-purpose machines incorporating Rockwell drill units to be so built that the units themselves can be moved forward or back with relation to the parent machine without loss of alignment. This feature facilitates removal and replacement of tools. Also time is saved in making set-up adjustments when the machine is used for a wide range of parts.

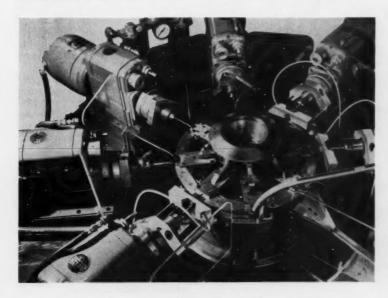
Circle Item 126 on postcard, page 265

Morris Machine Equipped for Processing Carburetor Part

A machine built recently by the Morris Machine Tool Co., Cincinnati, Ohio, performs twenty-three individual operations on a fourbarrel carburetor part at a production rate of 375 pieces per hour. This machine is an adaption of the firm's 67S design. It has a standard base, an indexing table, a center column, straight and angular drilling heads, and cooling and hydraulic systems. Although built for a special job, the machine has a minimum of special tooling.

In operation, the machine drills, reams, countersinks, taps, and spot-faces a variety of angular, vertical, and horizontal holes in the carburetor air horn die-casting. Six rack-fed auxiliary heads mounted on a platen or table that surrounds the indexing load table are employed to perform both horizontal and angular operations. The center column of the machine carries a hydraulically actuated mushroom head which feeds the vertical spindles into the parts at the proper station. This head also actuates the auxiliary heads.

The parts are carried on a table that indexes automatically to the six production stations. To present the necessary surfaces of the work-pieces to the various spindles, the parts are placed first in



Rockwell air-hydraulic drill units with sliding sub-bases

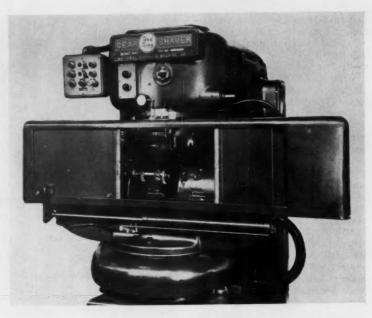
the "load cycle" fixture. Then, after completing a revolution of the indexing table, the parts are placed in the "transfer cycle" fixture, being rotated 180 degrees in the transfer operation. The load and transfer fixtures have a single hand-operated clamp. An automatic safety switch checks the clamping of the parts. If parts are improperly clamped, the table will not index. Automatic lubrication is provided for all moving parts.

Circle Item 127 on postcard, page 265

Semi-Automatic Loaders for Gear-Shaving Machines

Air-powered, semi-automatic loading devices, said to offer a low-cost method of increasing the production rates of standard Red Ring rotary gear-shaving machines, are now available from the National Broach & Machine Co., Detroit, Mich. Provided on the loaders are tailstock and splash-door air cylinder controls, electrical controls, and a special work locator designed to suit the particular gear or gears to be finished by the shaving process.

This equipment cuts down the seven operator functions formerly required to manually load and unload a standard gear-shaving machine to three functions. In addi-



Red Ring rotary gear-shaving machine equipped with semi-automatic loader and splash doors operated by air cylinders

tion, the loaders promote safety by assuring that the hands of the operator are kept out of the cutting area.

The operator simply places the gear in mesh with the cutter and rests it on the approximate locator, presses the cycle starting button.

and removes the gear at the completion of the tooth-shaving cycle of the machine.

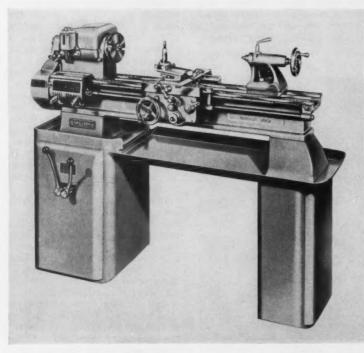
Circle Item 128 on postcard, page 265

Sheldon Lathes

Two new lathes are among the six machine tools being shown in operation at the National Metal Show by the Sheldon Machine Co., Chicago, Ill.—a 13-inch swing Sheldon UM56P lathe equipped with its new pedestal and a 15-inch Sebastian geared-head lathe.

The 13-inch swing lathe illustrated has a capacity of 34 inches between centers. The heavy castiron pedestal fully encloses the motor and drive and the tailstock leg has a large storage space for tools and accessories. "Zero Precision" tapered roller bearings used in this lathe have a single take-up for adjustment and wear. The apron is double-walled and has a friction disc type clutch for engaging the power longitudinal feed and power cross-feed. Double neoprene cog type V-belts are used on the spindle to provide greater pulling power and longer belt life. The quick-change gearbox has provision for cutting fifty-four different threads, as well as many special threads. Rapid selection of pitches and feeds can be made while the lathe is running.

Circle Item 129 on posicard, page 265



Sheldon 13-inch swing lathe with a newly designed pedestal



Natco high-speed drilling and tapping machine

Natco Multiple-Drilling and Tapping Machine

The manufacture of a highspeed, push-button controlled multiple drilling and tapping machine for medium-sized work has been announced by the National Automatic Tool Co., Inc., Richmond, Ind. The feed and control mechanism of this machine is designed to eliminate unnecessary operator motions and thus increase production. The machine is available with a single-spindle head, an adjustable spindle head, or a fixed center spindle head, making possible economical multiple drilling or tapping of small holes.

The push-button control has the following feed cycles: (1) standard cycle-rapid traverse forward, first or coarse feed forward, second or fine feed forward, rapid reverse, and stop; (2) jump feed cycle, using additional equipment -rapid traverse forward, first or coarse feed forward, rapid traverse forward, first or coarse feed forward, second or fine feed forward, rapid reverse, and stop; and (3) time delay reverse cycle, also using additional equipmentrapid traverse forward, first or coarse feed forward, second or fine feed forward, dwell against positive stop for predetermined time, rapid reverse, and stop.

Circle Item 130 on postcard, page 265

Testing Machines and Controllers

In addition to its Super "L" and Electromatic universal testing machines, the Tinius Olsen Testing Machine Co., Willow Grove, Pa., will exhibit a hand-operated Brinell testing machine at the National Metal Exposition. Automatic controllers for strain and other testing equipment are among the new electronic devices to be demonstrated.

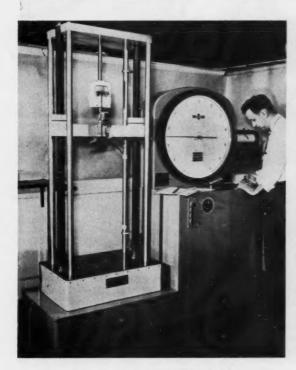
Circle Item 131 on postcard, page 265

Sheffield Air Gage for Inspecting Valve Body

A multiple-column air gage for inspecting twelve internal diameters simultaneously in an automobile transmission valve body is being manufactured by the Shefield Corporation, Dayton, Ohio. The gage consists of a work-holding and locating device on which are mounted six air spindles connected to a twelve-column Precisionaire. Two spindles are of the "step" type and have orifices to check two different diameters when in the gaging position.

The operator simply places the valve body on the locating block and brings the spindles into the part by rotating a hand-lever one-half turn. Instantly, the floats in the Precisionaire show which diameters are within the predetermined tolerance settings or how much they are over or under size.

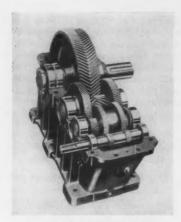
Circle Item 132 on postcard, page 265



A Tinius Olsen testing machine being demonstrated



Sheffield air gage for the inspection of valve body



Herringbone gear reducer equipped with roller bearings

Rollway Bearings with Endwise Float for Gear Reducer Shafts

Cylindrical roller bearings that allow endwise float are being made by the Rollway Bearing Co., Inc., Syracuse, N.Y., for the shafts of herringbone gear reducers manufactured by the W. A. Jones Foundry & Machine Co., Chicago, Ill. The floating feature of these bearings allows for thermal expansion, as well as for self-centering of the teeth. This automatic self-centering action is said to result in equalized load distribution over the helical teeth of the herringbone gears so that full face contact of the teeth is maintained and the danger of concentrated loads eliminated.

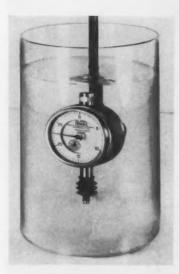


Fig. 1. Wetproof indicator made by Federal Products Corporation

These bearings are made with bores over 6 1/2 inches in diameter, and outside diameters of more than 10 inches. Rated load capacities are 119,175 pounds at a speed of 25 R.P.M. and 34,925 pounds at 1000 R.P.M.

Circle Item 133 on postcard, page 265

Federal Wetproof Indicator and Adjustable Air Bore Gages

A wetproof indicator, Fig. 1, fully protected against splashing coolants, oil, oil fog, or excessive dust, has been perfected by the Federal Products Corporation, Providence, R. I. A rubber protecting boot fits grooves in the stem and contact point, yet allows free movement of the rack and effectively seals the opening. Joints between the bezel and the dial as well as the back and dust cap have rubber sealing rings.

Other improvements include a heavier case to withstand rough



Fig. 2. Federal adjustable air bore gage

usage, a repositioned stem bushing, and crystal made of glareproof glass that will not discolor when exposed to oil or other liquids.

Another development of the company is a series of four adjustable air bore gages that have a measuring capacity from 1/2 inch to 8 inches. Previously, it was necessary to have a separate air plug for each different size to be measured. Now with an adjust-

able bore gage, Fig. 2, it is economically feasible to obtain extreme accuracy in checking a few pieces of a particular size.

Circle Item 134 on postcard, page 265







Wales adapters for press-brake bed rails facilitate mounting of punching and notching units

Wales Bed-Rail Adapters

A new series of Wales bed-rail adapters for press brakes has been announced by the Wales-Strippit Corporation, North Tonawanda, N. Y. These adapters are designed to be used with Wales press-brake bed rails for rapid, accurate mounting of the self-contained hole punching and notching units. Spring-check steel balls provide tension to hold the adapters securely in place. Two pilot-pin holes are located on one side of these adapters for straight-line hole punching, and a slot is located on the opposite side to facilitate front-to-back mounting for staggered hole punching patterns. A built-in scale on the bed rail, together with a center line on the adapters, facilitates left-to-right locating and mounting of the units.

After a set-up has been run, the group of units and adapters may be re-used in other punching and notching patterns. This eliminates the dead storage of special tooling by keeping the units in continuous operation.

Circle Item 135 on postcard, page 265

Cleveland "Speed Variator"

A simple, compact driving unit that provides a stepless variable output speed over a 9 to 1 ratio from a constant speed power source is being introduced by the Cleveland Worm & Gear Co., Cleveland, Ohio. This unit, called the Cleveland "Speed Variator," is based on a drive manufactured under a Swiss patent, and is now available from the Cleveland concern, which redesigned it.

Power is transmitted from the input shaft to the driving balls through a disc in pressure contact with the balls. A similar contact between the balls and the corresponding disc on the output side permits transmission of power to the output shaft. The relative

speeds of the two shafts are adjusted through the 9 to 1 range by the angular positioning of the axles on which the balls rotate. Close control of this speed setting adjustment is obtained by a worm and gear that can be operated either manually or through a variety of remote controlled devices. For manual operation, a handwheel is used with a geared position indicator.

The unit is said to be smooth and quiet in operation. A torqueresponsive mechanism acts between the driveshafts and discs to produce only the degree of contact pressure between the discs and the balls required for actual torque transmission. Because of this design, efficiencies of 75 to 90 per cent are said to be easily maintained over a wide range of operating conditions. The unit is made in nine sizes. The smallest size transmits 1/2 H.P. at an input speed of 1750 R.P.M. and 1/3 H.P. at 1150 R.P.M. The largest size transmits 10 H.P. at 1750 R.P.M. and 71/2 H.P. at 1150 R.P.M.

Circle Item 136 on postcard, page 265



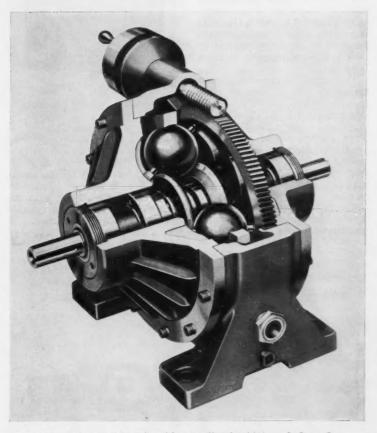
Improved Delta drill press introduced by the Rockwell Mfg. Co.

Improved Delta Drill Press

A 14-inch drill press, designed for rapid handling of precision drilling work, has been placed on the market by the Delta Power Tool Division, Rockwell Mfg. Co., Pittsburgh, Pa. This machine incorporates the features of the earlier 14-inch drill press but includes new ones, such as a streamlined full-length belt guard that can be swung up out of the way to facilitate cleaning and beltchanging. A pivoting motormounting plate permits quick belt tension release, facilitating speed changes and lengthening belt life. After changing the speed, a spring-loaded plunger automatically restores the correct operating tension to the belt. Uniform belt tension can be maintained by tightening a thumbscrew.

The modified quill allows a spindle travel of 45/16 inches. An opening to facilitate spindle removal, a quick-set depth gage with scale magnified more than two and one-half times, a self-locking depth stop calibrated to 0.002 inch, and an easily operated spindle return tension adjustment that provides for an infinite choice of tensions within a given range are other new features of this drill press. Made in multiple-spindle models of either floor or bench type.

Circle Item 137 on postcard, page 265



"Speed Variator" introduced by the Cleveland Worm & Gear Co.



High-speed cut-off blades placed on market by the Cleveland Twist Drill Co.

Mo-Max Cut-Off Blades

A line of ground high-speed cutoff blades made of Mo-Max cobalt has been introduced by the Cleveland Twist Drill Co., Cleveland, Ohio. These tools are advantageous in cutting today's harder and tougher steels. Even at red heat, they maintain their hardness and abrasion resistance.

Mo-Max is the name of a molybdenum-tungsten steel. Cutoff blades made of this material are available in sizes ranging from 1/16 inch thick by 1/2 inch high by 4 1/2 inches long to 1/4 inch thick by 1 3/8 inches high by 7 inches long.

Circle Item 138 on postcard, page 265



"Sphereflex" coupling made by the Philadelphia Gear Works

"Sphereflex" Coupling

The Philadelphia Gear Works, Philadelphia, Pa., is now offering industry a shaft coupling known as "Sphereflex" which has been used successfully in aircraft and other specialized fields. The male teeth of each half member of the coupling are cut on a true spherical arc while the internal teeth are cut with a straight root surface. Thus, the curved tooth maintains a constant area of contact with the internal tooth.

The standard coupling is suitable for angular misalignments up to plus or minus 31/2 degrees on each coupling half, giving a total of plus or minus 7 degrees. Special couplings are made for angular misalignments up to 14 degrees

Circle Item 139 on postcard, page 265

Bath Reversible Plug Thread Gages

Thread and cylindrical reversible gages, which are adjustable for use as depth gages with GO and NOT GO ends identified by color markings, are being manufactured by John Bath & Co., Inc., Worcester, Mass. These gages are designed to permit either end of each gaging member to be used for gaging.

The pin type reversible plug thread gages, stocked in sizes from No. 0 to 3/4 inch, are available for NC, NF, UNC, and UNF threads of Classes 2B, 3B, 2, and 3 fits. They consist of seven parts—a GO gaging member, green GO locking nut, split bushing, handle, split bushing, red NOT GO locking nut, and NOT GO gaging member.

The Trilock type reversible plug thread gage is stocked in the same type threads and classes as the pin type but in sizes 0.760 inch and larger. This type gage, not shown, consists of five parts—a GO locking screw, GO measuring member, handle, NOT GO measuring member, and NOT GO locking screw.

Circle Item 140 on postcard, page 265

Wheelco Capacitrols

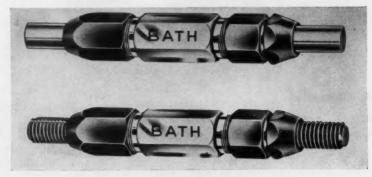
A small, compact Model 292 Capacitrol, here shown, has been designed for accurate indicating and instantaneous control in the process industries by the Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill. Both the temperature measuring system and the control chassis are of plug-in design. This feature per-



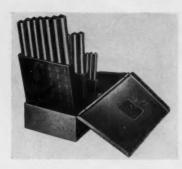
Wheelco Model 292 Capacitrol

mits removal of either for easy replacement and servicing without disturbing the instrument or external wiring. The balancing adjustment for tuning the alignment index and indicating pointer to exact coincidence, along with the control setting are all accessible from the front of the control.

Circle Item 141 on postcard, page 265



Pin type thread plug gages made by John Bath & Co., Inc.



Chicago-Latrobe High-Speed Drill Blank Sets

Precision ground and hardened drill blanks available in high-speed steels from Chicago-Latrobe, Chicago, Ill., in fractional sizes from 1/16 to 1/2 inch; in wire gage sizes from No. 1 to 60, inclusive; and in letter sizes from A to Z. These drill blanks come in enamel-finished metal containers with hinged tops.

Circle Item 142 on postcard, page 265



Oilgear Variable-Delivery Feed-Pump

Feed-pump brought out by the Oilgear Co., Milwaukee, Wis., to provide higher variable feeds which will remain accurate over a wide pressure range. This pump is intended for use with machines and processes employing automatic or semi-automatic repetitive motion sequences or cycles. Identical in design and operation to the previous Oilgear feedpumps, the new types have, however, over four times the capacity of the earlier packaged unit, although the mounting and over-all unit dimensions are identical. Maximum feeding pressure is 1000 pounds per square inch and

the maximum traverse pressure 300 pounds per square inch. Dual, direct solenoid-actuated, built-in control valves provide quick and positive control.

Circle Item 143 on postcard, page 265

"Chip-Hog" Heavy-Duty Turning Tool

Heavy-duty turning tool of improved "Chip-Hog" line now manufactured exclusively by the Gairing Tool Co., Detroit, Mich. The carbide insert is clamped to the high-alloy steel shank and is



adjustable two ways. It can quickly be replaced and is generally available with preformed front and side clearance angles. The tool is designed to permit the use of maximum feeds and speeds on lathes, shapers, planers, and boring mills without danger of causing cracks in the carbide insert. It is said to be equally efficient for semi-finishing and finishing cuts.

Circle Item 144 on postcard, page 265



Tool Control Unit for Metal-Working Machines

Tool control unit designed to reduce tool costs, decrease sharpening expense, and increase machine efficiency has been announced by The Cross Company, Detroit, Mich. This unit is now available for use with all types of metal-working equipment. It is made in four different sizes with one, two, four, or eight "Toolometers" which automatically shut down the machine when the tools need changing. Operation is simple. The pointer on the Toolometer is set to indicate the expected output of pieces per tool sharpening. It indexes counterclockwise at each cycle and on reaching zero automatically shuts down the machine for a tool change. A red area represents the danger zone or last useful period of tool life. If a tool control unit with more than one Toolometer is used, the operator changes all tools in the danger zone when the Toolometer stops the machine for a specific tool change.

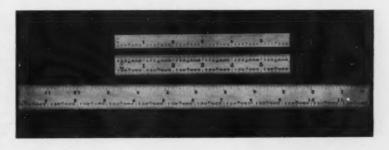
Circle Item 145 on postcard, page 265

Chromium-Finish Steel Rules

Non-glaring chromium-finish steel rules brought out by the Brown & Sharpe Mfg. Co., Providence, R. I., to meet the trend toward long-wearing precision tools that are easier to read as well as rust-and stain-resistant. The No. 312 flexible steel rule (top) is 6 inches

long and graduated in 1/16, 1/32, and 1/64 inch. The No. 316 tempered steel rule comes in the 6- and 12-inch lengths shown in the two lower views, both graduated in 1/8, 1/16, 1/32, and 1/64 inch as illustrated.

Circle Item 146 on postcard, page 265



Johnson Powdered Iron Bearings

Powdered iron bearing recently added to the line of sleeve type bearings made by the Johnson Bronze Co., New Castle, Pa. Several standard A.S.T.M. specifications for powdered metal bearings and structural parts are available, and powdered metal can be made to special specifications for such parts, provided they are required in quantity. Powdered iron bearings are said to offer the



advantages of low cost and good resistance to pounding and wear. Circle Hem 147 on postcard, page 265

Guide Bushings for Screw Machines

Carbide-lined guide bushings for Swiss type automatic screw machines announced by the Carl Hirschmann Co., Inc., Manhasset, N. Y. These new bushings have



helical slots instead of the conventional straight slots. The helical slots are said to provide for better lubrication of the bar and assure a quicker disposal of any chips which might enter the bushing. This guide bushing is an exclusive feature on Tornos Swiss type automatic screw machines.

Circle Item 148 on postcard, page 265



Nord Sheet-Metal Working and Plate-Cutting Machine

Sheet-metal working and platecutting machine designated the Model "G" Nordex, announced by the Nord International Corporation, Orange, N. J. This machine is reinforced for heavy-duty use and to reduce wear on the punches and dies. It is adapted to slot cutting, beading, folding, and irregular or free-hand cutting, also doming, circular beading, and contour cutting in addition to simple straight shearing.

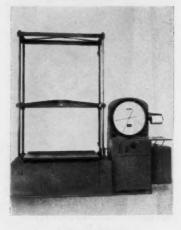
Circle Item 150 on postcard, page 265



An electrical device that enables the operator of a linear-motion machine to return the machine to a prior operating position within 1 per cent accuracy has been developed by Control Products Co., Inc., Oakdale, Pa. This unit, referred to as an "electric position transmitter for linear motion," was developed for use on a roller leveler in the steel industry, but

has manufacturing applications on other linear-action machines. Components of the unit include a transmitter on the machine, a control panel, and an instrument located at the operator's control station. The positions of the machine are measured and accurately transmitted to the operator by this equipment.

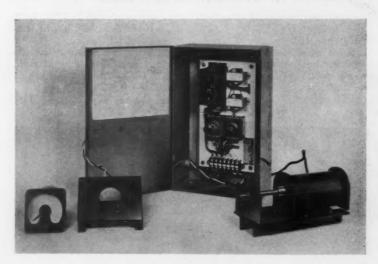
Circle Item 149 on postcard, page 265



Testing Machine for Spring Assemblies

Machine for accurate compression testing of complete spring assemblies introduced by the Tinius Olsen Testing Machine Co., Willow Grove, Pa. Loads up to 10,000 pounds are weighed by means of a set of levers mounted under the table of the testing machine and used in combination with the Selectorange electronic indicating system. Even eccentric test loads can be weighed accurately. Three testing ranges are standard, and the range can be changed at any

(This section continued on page 257)







"Mike" Your I.D.'s... No Masters Needed

The New Intrimik Internal Tri-Point Micrometer reduces measurement of bores and holes to a simple "miking" operation . . . saves you the cost of expensive plugs and setting rings. Made in 20 sizes, these handy micrometers measure bores from 0.275" to 8.000", . . . give readings directly in increments of 0.0001", 0.0002", or 0.0005" depending on size. Provide positive accuracy possible only through three-point bearing design. Write for complete illustrated Bulletin describing the new Intrimik.

BUY THROUGH YOUR LOCAL DISTRIBUTOR



BROWN & SHARPE MFG. CO. PROVIDENCE 1, R. I., U.S.A.

Milling Machines • Grinding Machines • Serew Machines Cutters • Machine Tool Accessories • Machinists Tools Electronic Measuring Equipment • Johansson Gage Blocks Fernament Magnet Chucks • Pumps

Printed in U.S.A

time during the test. All ranges have the same zero setting. A mechanical recorder is provided for obtaining an accurate record of tests. Clearance between screws is 60 inches, and standard columns permit testing of a 72-inch compression specimen.

Circle Item 151 on postcard, page 265

Holmes Combination Hydraulic Forcing and Straightening Press

Combination hydraulic forcing and straightening press brought out by the Stanley H. Holmes Co., Chicago, Ill., with a forcing table that can be quickly replaced by an interchangeable straightening table. This combination equipment adapts the machine for a wide

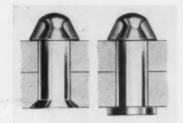


range of straightening and pressing operations, as well as a great variety of broaching, bending, burnishing, cutting-off forming, nibbling, molding, drawing, punching, trimming, and similar work. Built-in models with capacities ranging from 5 to 150 tons.

Circle Item 152 on postcard, page 265

Titanium Hi-Shear Lightweight Rivets

Hi-Shear rivets made by the Pheoll Mfg. Co., Chicago, Ill., under license from North American Aviation, Inc., are now available in titanium. Hi-Shear rivets are essentially threadless bolts. They consist of a pin having high shear strength and a malleable aluminum collar which is swaged into a groove near the end of the pin. The pins are furnished in C-130 AM titanium alloy, heattreated alloy steel, stainless steel, or 75S-T aluminum alloy. These rivets can quickly be driven from either end, using a one-piece rivet set fitted to the conventional rivet gun. A pneumatic squeezer can



also be used. The titanium rivets are 40 per cent lighter than the same rivets made in alloy steel. They have a minimum shear strength of 95,000 pounds per square inch and retain useful strength at temperatures up to 1800 degrees F.

Circle Item 153 on postcard, page 265



Lehigh Air Motor

Designed to combine in one compact unit an air cylinder, a four way valve, and a wide variety of valve controls, Lehigh air motors are now available in bores of 1 1/2-, 2-, and 3-inch diameters with any desired length of stroke. Only one connection is required to bring air to the motor. The hollow piston is filled with lubricating oil and sealed at the factory. This oil is fed out by capillary action through small radial holes to a wick located in a groove cut in the outside diameter of the piston. Thus, a constant film of oil on the inside cylinder wall is assured. Made by Air Control Division, Lehigh Foundries, Inc., Easton, Pa.

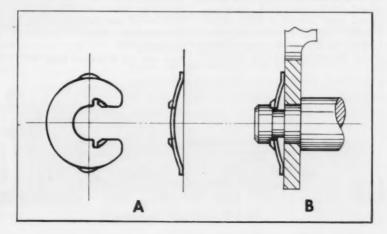
Circle Item 154 on postcard, page 265

Waldes Truarc Retaining Ring

A radially installed retaining ring, which can be locked in its groove and used as a shoulder against rotating parts, has been introduced by Waldes Kohinoor, Inc., Long Island City, N. Y. It is known as the Truarc series 5139 retaining ring, and is intended for use in the automotive, electronic, and aeronautical industries and for a wide variety of other applications in which an easily assembled, positive-locking fast-

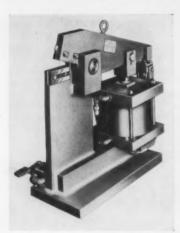
ener is required. The new ring, shown at A in the illustration, is made of spring steel and is shaped like a bowed horseshoe. When fastened to a shaft, it is locked in its groove by two prongs extending from the inner circumference of the open end, as shown at B. The ring is manufactured in sizes to accommodate shafts ranging in diameter from 1/8 to 1/2 inch, with larger sizes available.

Circle Item 155 on postcard, page 265



Curry Air-Operated Shear for Cutting Cold Bars

Air-operated shear for cutting cold ferrous and non-ferrous bars up to 11/4 inches in diameter, developed by Curry Air Shear Corporation, Pittsburgh, Pa. This unit operates from any standard shop air supply or compressor at pressures from 60 to 125 pounds per square inch. It has practically no wearing parts and operates only while cutting. The 6-inch knives have four cutting edges which can be adjusted by set-

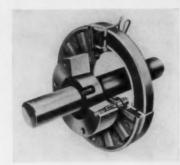


screws after grinding. The shear will cut cold mild steel 1 inch in diameter using air pressure at 80 pounds per square inch.

Circle Item 156 on postcard, page 265

Warner Electric Brake and Clutch

One of a complete line of electric brakes and clutches, suitable for use in all types of industrial machinery, recently placed on the



market by the Warner Electric Brake & Clutch Co., Beloit, Wis. The new type brakes and clutches which are incorporated in this line will be manufactured in a wide range of sizes, and at present both brakes and clutches are being made in the torque range of 8 to 700 foot-pounds. The brake features a replaceable facing, similar to the replaceable lining found in automobile brakes. It contains only three main parts: the field, the replaceable face, and the armature. The adjustment for wear on the brake is completely automatic and requires no manual servicing.

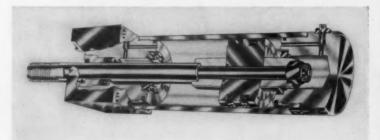
Circle Item 157 on postcard, page 265



Spacemaker cylinders are now made by the Tomkins-Johnson Co., Jackson, Mich., for use with either air or oil. They are unusually compact due to the elimination of tie-rods. A solid steel head and heavy-wall seamless-steel body assure a high safety factor, sturdy construction, and long life. The units are available with the same mounting diameter

in either an air cylinder or a lowpressure hydraulic cylinder, for a maximum of 200 pounds per square inch of air or 750 pounds per square inch of oil. Improved cushions are fast-acting. Six mounting styles, with bores of 1 to 4 inches, and strokes from 1 to 12 inches, are standard designs in this new line.

Circle Item 158 on postcard, page 265





Micrometer with Built-In Dial Indicator

Etalon 25N micrometer. marketed by the Alina Corporation, New York City, is designed with an integral dial indicator. Retractable anvil permits quick introduction of the part to be checked without danger of scratching it. The load on the retracting mechanism is adjustable, yet in no way influences the reading. Both the dial indicator and the barrel of the micrometer have 0.0001inch graduations. The dial permits a reading of plus or minus 0.002 inch. For convenience, the tolerance hands of the indicator are of different colors.

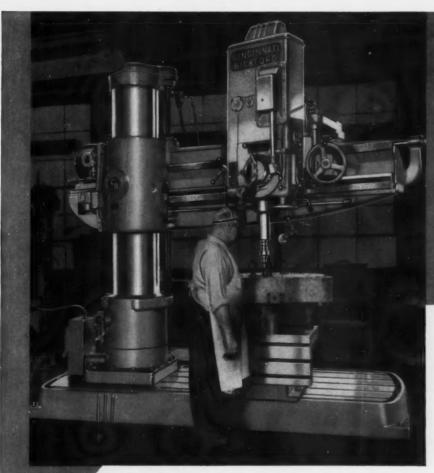
Circle Item 159 on postcard, page 265



Errington Tap-Drill Attachment

A tap-drill attachment developed by the Errington Mechanical Laboratory, Inc., Staten Island, N. Y., combines the operations of drilling reaming, counterboring, countersinking, and tapping on one drill press. It is only necessary to slide the work under the head from one spindle of the attachment to another. All spindles are hardened and ground, with the tapping spindle having an automatic reversal. The attachment is available with two, three, or four spindles, spaced to handle work up to 5 1/2 inches in outside diameter. The spindles have a capacity for 1/4inch drills and 5/16-inch taps.

Circle Item 160 on postcard, page 265



6-foot arm, 17-inch column Super Service Radial Drill at Kelsey-Hayes Wheel Company, Detroit, Michigan.

Photos courtesy of Kelsey-Hayes Wheel Co Detroit, Michigan.



A typical tool-room job, involving a wide range of speeds and feeds, and extreme accuracy.

80 YEARS OF SERVICE

BICKFORD

"excellent

IN OUR TOOL ROOM"

The tools, dies and fixtures for the mass production of Kelsey-Hayes wheels, brake-drums and other automotive parts can only be produced on accurate machines. Since 1930 Cincinnati Bickford radial and upright drills have been used here. The machine shown above, recently installed, is rated "excellent" by this user, because of its many features for accuracy, ease of operation, safety, and productive capacity. Investigate these advantages of Super Service Radials—Write for Booklet R-29.

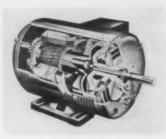


RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-259



Controls for Fractional Horsepower Drives

A line of combination power and speed control units engineered to meet specific needs of fractional horsepower drives has been developed by the Dynamatic Division of Eaton Mfg. Co., Kenosha, Wis. These Adjusto-Spede drives are a combination of alternating-current constant-speed induction motors, eddy-current couplings, and electronic speed controls. They are readily adaptable to many applications requiring closely controlled adjustable speeds and can be operated continuously at any speed within range limits. The only wiring required is a simple connection to a standard singleor three-phase power line.

Circle Item 161 on postcard, page 265

G-E Process Timer

A process timer, featuring oneknob control, has been announced by the Instrument Department of the General Electric Co., Schenectady, N. Y. The timer, designated the TSA-21, will control the simultaneous closing of one electric circuit and opening of another. Industrial applications for the new process timer include molding presses, machine tools, and automatic mixing operations. The unit includes one set of time-opening main contacts and another set of electrically separate time-closing main contacts. The trip point of



the main contacts can be adjusted by an external knob. Also, each timer has a set of instantaneous contacts which can be used independently or as hold contacts for the timer solenoid. The time scale reads from 0 to 100 per cent.

Circle Item 162 on postcard, page 265

Wesson Tool-Holders with Height Gage

Band type Multicut tool-holders, a product of the Wesson Co., Detroit, Mich., now have a built-in

Adjustable-Torque Driver for Lead-Screw Tapping

A releasing type driver, capable of greatly reducing tap breakage, has been announced by Scully-Jones & Co., Chicago, Ill. The driver has been designed with a spring-loaded shank to accommodate lead-screw tapping. An adjustable-torque clutch mechanism assures complete release and eliminates objectionable friction, heat.

and impact action. The driver may be pre-set to release when machining torque approaches the strength limits of the tap under required operating conditions. Special collets, compression features, and driver shanks are available when required to meet individual job specifications.

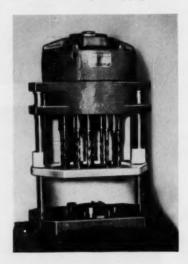
Circle Item 164 on postcard, page 265





precision-ground carbide height gage. Brazed to the holder, the gage eliminates the need for additional rules or other devices ordinarily required in resetting inserts exactly on center. The operator merely raises the insert until it is flush with the gage. By feeling the top of the insert and gage with the finger tip, the insert can be set accurately within 0.001 inch. Another feature is an elliptical slot for easy insert removal, even under severe cutting operations which generate excessive heat and "bake" the coolant and metal dust around the insert.

Circle Item 163 on postcard, page 265



New Series of Zagar Gearless Drill Heads

Zager Tool, Inc., Cleveland, Ohio, has added a new "800" series to its line of standard gearless drill heads. Larger-size spindles, up to 21/2 inches in diameter, are incorporated for drilling holes up to 11/2 inches in diameter. This series can be furnished with a large-size Zagar self-clamping drill jig. The tooling package is complete for application on any conventional heavy-duty drill press.

Circle Item 165 on postcard, page 265

SNYDER SPECIAL 21-STATION AUTOMATIC LINE

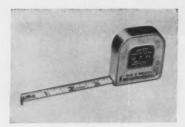
TRANSFER MILLS, DRILLS, CORE-DRILLS, REAMS AND TAPS INTAKE MANIFOLDS;
TESTS MANIFOLD FOR AIR LEAKAGE AND VOLUMETRIC AIR FLOW, INSPECTS
PROCESSING PROGRESSIVELY, MARKS REJECTS; INSERTS HEATER TUBES;

PROCESSES 130 UNITS AN HOUR AT 80% EFFICIENCY.

SNYDER

TOOL & ENGINEERING COMPANY
3400 E. Lafayette, Detroit 7, Michigan
29 Years of Successful Cooperation

with Leading American Industries



Lufkin Tape-Rule with White Blade

Tape-rule with white blade added to line of measuring tapes and rules made by the Lufkin Rule Co., Saginaw, Mich. It is called the "White Clad Mezurall." The blade is finished in pure white with bold black figures and black graduations. The tape-rule is coated with a clear abrasion-resistant plastic to resist wear, and has a selfadjusting end hook. Graduations are in consecutive inches to 1/16 inch on both edges. The first 6 inches of the upper edge is graduated to 1/32 inch. This rule is now being furnished in 6-, 8-, 10-, and 12-foot lengths.

Circle Item 166 on postcard, page 265

Denison Four-Way Valves

Pilot-actuated, solenoid-controlled, four-way valve brought out to meet a wide range of operating requirements. The valves in this



line can be used in circuits operating at pressures up to 3000 pounds per square inch. Different combinations and arrangements of the valve spools can be employed to suit specific applications. Adjustable pilot chokes for smooth spool reversal are offered as an optional feature. Capacities are 20 gallons per minute for the 3/4-inch pilot valve and 1 1/4 gallons per minute for the 1/8-inch solenoid valve. These valves are interchangeable with many valves now

in use. Product of Denison Engineering Co., Columbus, Ohio.

Circle Item 167 on postcard, page 265

Hallowell Knock-Down Tool Cabinet

Knock-down Hallowell tool cabinet, designed for use in tool and maintenance shops, production lines, gage rooms, garages, and



hangars, developed by the Standard Pressed Steel Co., Jenkintown, Pa. The steel parts can be packaged for shipment in cartons only one-quarter the size of the assembled cabinet and can be boltand-nut assembled in four simple operations with a screwdriver and a wrench. The knock-down cabinet comes in single-door and doubledoor models, with a green enamel finish. The single-door model has two adjustable shelves, a working top 15 inches by 21 inches, and is 34 inches high. The two-door style has one adjustable shelf, is 351/2 inches high, and comes in two topsizes-181/4 by 36 and 24 by 36 inches. Furnished with detachable feet or with 3-inch steel- or rubber-tread swivel casters.

Circle Item 168 on postcard, page 265

Valve Designed for Remote Control

"Retrold," or remote-controlled, valve announced by Ross Operating Valve Co., Detroit, Mich. This



four-way, base-mounted, pressureoperated valve is adaptable to a wide range of industrial applications. It is controlled by air from a remote pilot valve which may be hand-, foot-, cam-, or solenoidactuated. Standard models have side ports in the 1/4- to 3/4-inch pipe sizes. The 1- and 11/4-inch sizes have bottom ports. Main valve pressures can go to 125 pounds per square inch and pilot air pressures may be equal to or greater than the main valve pressures, but not less than 30 pounds per square inch. Operating temperatures may be as high as 175 degrees F.

Circle Item 169 on postcard, page 265



Formsprag Clutch-Coupling Unit

Clutch-coupling unit introduced by the Formsprag Co., Van Dyke, Mich., which provides over-running features in combination with a flexible coupling. For most applications of this kind, two dif-ferent types of clutch-coupling units are required to compensate for the large range of operating conditions encountered. To meet these requirements, the Clutchcoupling unit is made in two types, one of which is specifically designed for low-speed over-running applications while the other is intended for use where practically continuous high-speed over-running conditions are encountered.

Circle Item 170 on postcard, page 265

Ram Type Vertical Milling Machine—Correction

The speed range of the Model 1-B vertical miller described and illustrated on page 213 of September Machinery was erroneously given as 75 to 300 R.P.M. The correct speed range of this machine, manufactured by the Industrial Metal Products Corporation, Lansing, Mich., is 75 to 3000 R.P.M.

Buhb SPECIAL...



Performs 18 operations on 124 transmission servo bodies an hour!



This 5-way automatic-indexing dial-type Buhr Special has a 6-station, 2-position fixture which features relocating the part in each fixture.

Especially noteworthy is the special milling head arranged with automatic back-up so that cutters do not disturb the close micro-finish on their return stroke. (See inset blowup above.)

A tool board is used to keep tool-changing time to minimum. .

Multiple heads are of Buhr ball-bearing construction with shaved gears and broached-and-splined drives—a Standard Feature on all Buhr Specials.

Available at your request — our 48-page Catalog or a consultation with one of our sales executives.





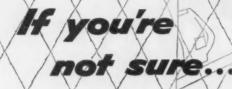


BUHR MACHINE TOOL COMPANY

252 GREEN STREET, ANN ARBOR, MICHIGAN

MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY

Solidly Engineered . . . Precision Built . . . for World's Leading Manufacturers





ask your tool crib supervisor

Sure you get so fed up with claims and boasts about tools. They all seem plausible enough, but what can you believe? Here's an out! Go check with your tool crib foreman. He'll tell you what air impact wrench is asked for the most. Chances are he'll say "Chicago Pneumatic."

And with good reason, too! The CP-360 above, for example, is well-balanced and a cinch to handle. Designed for faster, low-cost nut running in production line and maintenance, its ease of operation reduces operator fatigue—gets greater work output per operator per day.

Available in seven sizes, CP Air Impact Wrenches are supplied from ½ to 1¾ inch bolt size in straight and angle head models. Can be had with side, pistol grip or straight handles. Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.

Chicago Pneumatic

PNEUMATIC TOOLS . AIR COMPRESSORS . ELECTRIC TOOLS . DIESEL ENGINES . ROCK DRILLS . HYDRAULIC TOOLS . VACUUM PUMPS . AVIATION ACCESSORIES

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

GEAR TESTERS—George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y. 100-page book describing all models of Mahr precision gear testers, which are being introduced in this country by Scherr. In addition, the book gives valuable information regarding modern methods of testing and inspecting all types of gears. Included are various gear tables, This book is available to key personnel in gear inspection and gear cutting departments upon business letterhead request direct to the above address.

ZINC-BASE DIE CASTINGS—St. Joseph Lead Co., 250 Park Ave., New York 17, N. Y. 24-page booklet entitled "Bunker Hill Zinc and Die Casting," containing technicol data on the role of zinc as a base metal for die-casting alloys. Various commercial finishes which may be applied to zinc-base die-castings and applications of such castings are described. This booklet can be obtained by writing on a company letterhead direct to the above address.

CUTTER GRINDING—Ingersoll Milling Machine Co., Rockford, Ill. Booklet 59B, containing 52 pages of reference material on cutter grinding aids for tool grinders and machine shop supervisors. Drawings on fourteen basic grinds cover situations commonly encountered in general shop work. Included are recommended speeds and feeds for face-milling, and finger settings used on the Ingersoll cutter grinder for grinding various primary clearances. Causes of chatter are considered. Also, there is a carbide comparison chart.

METAL-QUENCHING—Gulf Oil Corporation, Pittsburrh, Pa. 24-page booklet entitled "Gulf Super-Quench—the Revolutionary Dual-Action Quenching Oil," containing technical information on the quenching of metals, including such topics as the mechanism of heat removal; properties of an ideal quenching medium; effects of increasing the bath temperature and the degree of agitation; hardenability of steels; severity of quench; and distortion and cracking. The material is illustrated with charts and graphs. Four case studies show the solution to some difficult quenching problems. . . 2

DIE-CASTING—American Zinc Institute, Inc., New York City. 23-page booklet entitled "Die Casting—Molten Metal to Finished Part—Direct," showing pictorially the basic steps of the die-casting process and giving concise descriptions of the dies and machines used to produce uniform parts of complex shape within close dimensional limits. Zinc, aluminum, magnesium, and copper-base die-casting alloys are considered, and fifteen examples of die-casting products using these four alloy types are presented. . . 3

TURRET LATHE TOOLS—Warner & Swasey Co., Cleveland, Ohio. 197-page book, the seventh edition of the turret lathe tool catalogue, containing illustrated listings of Warner & Swasey standard tools, chucks, collets, and miscellaneous equipment, and explaining how each tool works and the jobs for which it can be used. This book is available without charge to purchasing agents, tool designers, engineers, time study men, superintendents, foremen, operators, and set-up men.

ROTOBLAST DESCALING MACHINE—Pangborn Corporation, Hagerstown, Md. Bulletin 224, descriptive of the new Rotoblast machine developed for economically descaling steel sheets, plates, and coils after hot-rolling or heat-treating, and explaining how the machine operates. There are four types of the standard machine, handling coils or sheets up to 60 inches wide and at least 6 feet long, in any thickness from 18 gage upward. Special machines can be built to handle sheets or plate up to 15 feet in width.

COMBINATION MAGNETIC AND FABRIC FILTER—Barnes Drill Co., Rock-

ford, III. Bulletin 350C consists of 16 pages featuring Kleenall combination magnetic and fabric filters. Described are the company's laboratory facilities and application, engineering, and testing services which are available to help solve both large and small coolant cleaning problems. A section "Facts About Filtration" contains brief reports from users of the Kleenall filter unit. 6

SPRAY-COOLANT—Bar Products Co., Rockford, III. Leaflet describing the "Spra-Kool" system for all types of dry grinding operations, and showing some applications. Besides dry grinding and polishing operations, the system can be used for certain drilling, milling, chamfering, or boring operations that do not require flood coolant. One gallon of coolant, it is said, is sufficient for four to six hours of continuous operation. . . 7

ECCENTRIC GEARED PRESSES—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 66 comprises 28 pages featuring the new Niagara straight-side, single-

> Permit No. 53 (Sec. 34.9, P. L. & R.) New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY-

MACHINERY

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

READERS' SERVICE DEPT.



action, eccentric geared presses to handle a variety of large, heavy-tonnage, drawing, punching, and blanking work. The construction of these presses is concisely described, and tabulated specifications for the entire 100- to 1000- ton press line are included.

HEAT-TREATING NICKEL-ALLOY CAST IRONS—International Nickel Co., Inc., New York City. Bulletin A-115, describing how to increase the usefulness of cast irons and improve the properties by alloying and heat-treatment. Data are presented by means of thirteen charts and eleven tables. A glossary of selected iron and steel terms relating to heat-treatment operations is included. 11

HYDRAULIC PRESSES—Lake Erie Engineering Corporation, Buffalo, N. Y. Bulletin 1-1, consisting of a buyer's guide describing the basic types of hydraulic presses manufactured by the company, aimed to assist in selection. Then, with the assistance of company engineers, customer specifications can be determined, thus "tailoring" the Lake Erie press to exact requirements. 12

HIGH-SPEED SURFACE BROACHING—Colonial Broach Co., Detroit, Mich.

MACHINING TITANIUM—Cincinnati Milling Machine Co., Cincinnati, Ohio. Pamphlet M-1866, consisting of a reprint of several articles on the subject of machining and grinding titanium, under the following titles: "Fundamental Factors in Machining Titanium"; "Machining Titanium"; "Grinding of Titanium and Its Alloys"; and "Grinding Titanium No Longer a Problem." 15

DIES FOR DRAWING WIRE, ROD, BAR, AND TUBE—Vascoloy-Ramet Corporation, Waukeegan, III., Catalogue VR-461 Breaker Co., Philadelphia, Pa. Bulletin 5306, descriptive of an electro clutch which has many applications in power transmission where several output speeds are desired with a constant input speed. Diagrams show a number of possible arrangements; a table is given on sizes, ratings, and other pertinent data. 18

PRECISION TOOLING FACILITIES— Ehrhardt Tool & Machine Co., St. Louis, Mo. Bulletin illustrating the facilities of this manufacturer of precision gages, dies, jigs, and fixtures. The tool and die shop has a production capacity of approximately 4500 hours per week. .22

ELECTRONIC MACHINING AND GRIND-ING—Elox Corporation of Michigan, Clawson, Mich. Fact file, consisting of a set of bulletins explaining the new process of electronic machining and grinding—how it works, cost analysis of difficult machining jobs, how electrodes are made, how to convert to electronic grinding, and cose histories. 23

AUTOMATIC MULTIPLE-SPINDLE MA-CHINES—Bodine Corporation, Bridgeport, Conn. Bulletin giving twelve case histories which show how Bodine automatic multiple-spindle machines for drilling, tapping, milling, screw inserting, and assembly of small parts have been utilized by various manufacturing concerns.

GRINDING MACHINERY—Lobdell United Co., Wilmington, Del. Folder de-

Product Information Service

Use postage-free Business Reply Card below for further information concerning New Catalogues described in this issue and products mentioned in the editorial pages or advertisements.

	CIT	CO.	COMPANY	TITLE	NAME		PAGE	PAGE		For	157 1	143	129 1	115 1	101 1	57	43	29	3	_	item PLE
		ADD	AN	*				:	2	more	Un OR	144	30		02	U1 09	#	30	16	2	-
		ADDRESS			:	Ple	:	:	editorial		159	145	131	117	2	59	45	31	17	w	numbers
		:				Please	P	P	al or	details	160	146	132	3	104	60	46	32	18		
		:	:		:	prin	PRODUCT	PRODUCT		s on	161	147	133	119	05	61	47	S	19	U)	Sn on
		:	:	:		print your name		_	advertising		162	148	134	20	106	62	40	34	20	•	which y
į		:	:		:	Š	:	:	1	products	163	149	135	121	107	63	49	35	21	7	RE I
-	ZONE		:		:	107					164	150	136	122	000	64	50	36	22	00	Z
		:		:	:	and			pages,	91	165	151	137	123	9		51	37	23	9	wish
:		:		:					3	mentioned	166	152	138	124	=		52	38	24	10	INFORMATION. u wish further
1	TATE	:	:	:	:	address			5	<u>-</u>	167	153	139	125	=		53	39	25	=	Į X
		:	:	:	:	8	:	:	below		168	154	140	126	112		54	40	26	12	Circle
		:	:	:	:		:	:	=	November	169	155	141	127	=		55	-	27	13	2
		:	:	:			:	: .		507	170	156	142	128	=		56	42	28	14	flon.

scribing the Bridgeport line of grinding machines—face and knife grinders, vertical surface grinders, traveling head knife grinders, and floor grinders. Specifications of this line, which was recently acquired by Lobdell, are given. 26

HEAVY-DUTY TURNING TOOLS—Gairing Tool Co., Detroit, Mich. Booklet describing an improved line of "Chip-Hog" heavy-duty turning tools for semi-finishing and finishing cuts. There are three styles—for straight turning, for plunge-cutting from cross-slide, and for turning up to, or facing a shoulder—with both flat and step carbide inserts. 28

GEARLESS DRILLING HEADS—Zagar Tool, Inc., Cleveland, Ohio. Technical data sheets showing how the Zagar gearless drill head now can have drill and tap spindles as close as the sum of the drill diameters. For example, 1/2-inch drills and 1/4-inch drills can now be placed on 3/4-inch centers. 29

TOOL STEEL BRAND NAMES—Uddeholm Co. of America, Inc., New York City. Chart showing general classification, S A E, AISI, and J.I.C. numbers for fifteen different types of tool and die steels, as well as brand names used for those steels by twelve leading mills. . . 35

COLD-PRESSURE WELDING OF NON-FERROUS METALS—Utica Drop Forge & Tool Corporation, Utica, N. Y. Booklet giving general information on the Koldweld process for cold-pressure welding and showing numerous applications of Koldweld tools and dies in industry . . 39

(Continued on next page)

FIRST CLASS
Permit No. 53
(Sec. 34.9, P. L. & R.)
New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY-

MACHINERY

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

PIRST CLASS
Permit No. 53
(Sec. 34.9, P. L. & R.)
New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY-

MACHINERY

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

READERS' SERVICE DEPT.



quired by the company. Some average HIGH-SPEED THREAD-ROLLING MA-CHINE—Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Circular 942-A, descriptive of the company's new type of thread-rolling machine which cutting times are listed. PLUG AND RING GAGES—DeKalb Pre-cision Industries, Waterman, III. Booklet descriptive of DeKalb cylindrical plug uses planetary dies to thread up to 2000 and plain ring gages, as well as gage sets, giving dimensions and prices. . . 47 blanks per minute. . TRACING TEMPLATES OF TOGGLE CLAMPS—Detroit Stamping Co., Detroit, FLATGROUND DIE STEEL—Simonds Saw & Steel Co., Fitchburg, Mass. Data booklet listing more than 500 stock sizes of the company's line of flatground die steel, and explaining various uses of Mich. Set of 68 tracing templates of De-Sta-Co toggle clamps, for engineers and draftsmen. The template drawings are available in full, half, or quarter this alloy tool steel. . . . PROJECTION AND SPOT-WELDERS— Sciaky Bros., Inc., Chicago, III. Bulletin 324-2, covering all phases of Sciaky VALVES—Crane Co., Chicago, III. 20-page pamphlet entitled "Choosing the Right Valve," describing the three prinair-operated press type, low-impedance, cipal valve types—gate, globe, and check—and giving basic information designed to aid specifiers and buyers of piping equipment. ... OIL-RETAINING BRONZE BEARINGS— Bound Brook Oil-Less Bearing Co., Bound Brook, N. J. Stock list No. 4, presenting more than 600 sizes of Compo oil-retain-ing porous bronze bearings, and providing ABRASIVE CUT-OFF MACHINES-Lobdell United Co., Wilmington, Del. Leaflet descriptive of the Bridgeport "Abrasaw" abrasive cut-off machines recently ac-CITY HILL For 54210 SAN- FF COMPANY PAGE editorial detalls PRODUCT PRODUCT 9 print advertising 9 your products MOZ name mentioned and 2 STATE 5 belows

5

Novembe

more

editorial

advertising 9

pages, mentioned

2

= belows 5

Nove

products

details orial or

PAGE

PRODUCT PRODUCT

Please

print

address

card

6

void

after

February

M-11/84

card

-

blov

after

February MOZ

CHT

COMPANY

PLEASE SEND US MORE INFORMATION. Circle below tem numbers on which you wish further information. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 33 34 35 36 37 38 39 40 41 42 29 30 31 33 34 35 36 37 38 39 40 41 42 29 30 31 33 34 35 36 37 38 39 40 41 42 29 30 31 33 34 35 36 37 38 39 40 41 42 29 30 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 32 33 34 35 36 37 38 39 40 41 42 29 30 31 32 33 34 35 36 37 38 39 40 41 42 37 102 103 104 105 106 107 108 109 110 111 112 113 114 38 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 39 13 13 13 13 13 13 13 13 13 13 13 13 13	57 15	43 14	29 13	15 11	01 10	57 1	43 4	29 3	15	-	S VEV	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	8 159	4 14	0 131	6 113	2 103	-	4 45	0 3	6 17	140	E SE	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	160	5 146	132	7 118	104	9 60	46	33	7 10	_	3 6	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	161	147	133	119	105	61	47	33	=		3 5	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	162	148	134	120	106	62	4	2	20		MOR	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	163	149	135	121	107	63	\$	35	2	¥	¥=	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	164	150	136	122	2	1	50	36	22	00	40	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	165	151	137	123	109		51	37	23		I A	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	166	152	138	124	110		52	*	24	10	NON	1
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	167	153	139	125	Ξ		2	39	25	=	= 0	
PLEASE SEND US MORE from. Heam numbers on which y 14 1 2 3 4 5 6 28 15 16 17 18 19 20 2 42 29 30 31 32 33 34 3 56 43 44 45 46 47 48 4 57 58 59 60 61 62 6 114 101 102 103 104 105 106 10 118 115 116 117 118 119 120 12 119 120 131 132 133 134 13 156 143 144 145 146 147 148 14 170 157 158 159 160 161 162 16	168	154	140	126	112		54	8	26	12	mfor e	
PIEASE SEND US MORE Hom numbers on which y 1 2 3 4 5 6 15 16 17 18 19 20 2 29 30 31 32 33 34 3 43 44 45 46 47 48 4 57 58 59 60 61 62 6 101 102 103 104 105 106 10 115 116 117 118 119 120 12 129 130 131 132 133 134 13 143 144 145 146 147 148 14 157 158 159 160 161 162 16	69	55	141	127	=		55	=	27	3	35	
A SEND US MORE numbers on which) 2 3 4 5 6 16 17 18 19 20 2 30 31 32 33 34 3 44 45 46 47 48 4 58 59 60 61 62 6 102 103 104 105 106 10 116 117 118 119 120 12 130 131 132 133 134 13 144 145 146 147 148 14 158 159 160 161 162 16	170	156	142	128	114		56	42		7	9 6	
A SEND US MORE numbers on which) 2 3 4 5 6 16 17 18 19 20 2 30 31 32 33 34 3 44 45 46 47 48 4 58 59 60 61 62 6 102 103 104 105 106 10 116 117 118 119 120 12 130 131 132 133 134 13 144 145 146 147 148 14 158 159 160 161 162 16	 		. +		-	 ~ ~		-				
A SEND US MORE numbers on which) 2 3 4 5 6 16 17 18 19 20 2 30 31 32 33 34 3 44 45 46 47 48 4 58 59 60 61 62 6 102 103 104 105 106 10 116 117 118 119 120 12 130 131 132 133 134 13 144 145 146 147 148 14 158 159 160 161 162 16	15	14	12	11	10	UR	*	10	-		72	
MORE which) 5 6 6 9 20 2 3 34 3 7 48 4 4 1 62 6 10 12 12 12 13 134 13 14 13 16 16	7 15	14	130	111	103	7 5	-	9	-	_	3 2	
MORE which) 5 6 6 9 20 2 3 34 3 7 48 4 4 1 62 6 10 12 12 12 13 134 13 14 13 16 16	159	1 145	131	117	103	55	45	21	17	-	M SE	
MORE which) 5 6 6 9 20 2 3 34 3 7 48 4 4 1 62 6 10 12 12 12 13 134 13 14 13 16 16	160	144	132	110	101	60	46	*	=	_	2 6	
MORE INFORMATION. Circle below which you wish further information. 6 7 8 9 10 11 12 13 14 20 21 22 24 25 26 27 28 34 43 36 37 38 39 40 41 42 48 49 50 51 52 53 54 55 56 62 63 64 57 168 107 108 109 119 111 112 113 114 120 121 122 123 124 125 126 127 128 134 135 136 137 138 139 140 141 142 148 149 150 151 152 153 154 155 156 162 163 164 165 166 167 168 169 170	161	147	133	119	105	61	47	22	19	-	3 5	
H INFORMATION. Circle below by you wish further information. 7 8 9 10 11 12 13 14 21 22 23 24 25 26 27 28 35 36 37 38 39 40 41 42 49 50 51 52 53 54 55 56 63 64 107 108 109 110 111 112 113 114 121 122 123 124 125 126 127 128 135 136 137 138 139 140 141 142 149 150 151 132 133 134 155 136 163 164 165 166 167 168 169 170	162	148	134	120	106	62		-	20		MON	
NPORMATION. Circle below wish further information. 8 9 10 11 12 13 14 22 23 24 25 26 27 28 36 37 38 39 40 41 42 50 51 52 53 54 55 56 64 106 109 110 111 112 113 114 122 123 124 125 126 127 128 136 137 138 139 140 141 142 150 151 152 153 154 155 156 164 165 164 167 168 169 170	163	149	135	121	107	63	*	25	21	7	7 -	
RMATION. Circle below rish further information. 9 10 11 12 13 14 23 24 25 26 27 28 37 38 39 40 41 42 51 52 53 54 55 56 109 110 111 112 113 114 123 124 125 126 127 128 137 138 139 140 141 142 151 152 153 154 155 156 165 166 167 168 169 170	1	150	136	122	100	2	50	36	22		N N	
TION. Circle below further information. 10 11 12 13 14 24 25 26 27 28 38 39 40 41 42 52 53 54 55 56 110 111 112 113 114 124 125 126 127 128 138 139 140 141 142 152 153 154 155 156 166 167 168 169 170	165	5	137	123	3		61	37	23			
L. Circle below her information. 11 12 13 14 25 26 27 28 39 40 41 42 53 54 55 56 111 112 113 114 125 126 127 128 139 140 141 142 153 154 155 156 167 168 169 170	166	152	138	124	=		22	*	24	-	10	
Irele below Information. 12 13 14 26 27 28 40 41 42 54 55 56 112 113 114 126 127 128 140 141 142 154 155 156 168 169 170	167	153	139	125	=		53	39	25	=	4	
marion. 13 14 27 28 41 42 28 26 113 114 113 114 117 128 119 128 119 129	168	154	140	126	112		2	40	26	12	Infor	
12	169	155	141	127	113		=	1	27	===	1	
	170	156	142	128	=			-	28	-	3 4	

machining instructions and pertinent engineering data,

DESIGNING IRON CASTINGS—Hamilton Foundry & Machine Co., Hamilton, Ohio. Booklet entitled "How Design is Affected by Foundry Practice," aimed to help in designing iron castings to achieve maximum quality. ...

CONTROLLED CARBON FURNACE AT-MOSPHERE—Leeds & Northrup Co., Philadelphia, Pa. Catalogue TD4-620 (2), explaining the principle of operation of the Microcarb system for control of carbon potential in Homocarb fur-

CHECKING TEMPERATURES—Thermo Electric Co., Inc., Saddle River Township, Rochelle Park Post Office, N. J. Bulletin 61, on the Thermo electronic self-balancing indicator for quickly checking

COOLANT FILTERS-Industrial Filtrorion Co., Lebanon, Ind. Folder on Del-park coolant filters for use on Landis precision grinders. There is an explana-tion of how the Delpark filter oper-

DUCTILE IRON—International Nickel Co., Inc., New York City. Bulletin DI-15, on Ductile iron and its significance to the foundry industry. Its machining characteristics.

IMPREGNATING POROUS METALS— American Metaseal Mfg. Corporation, West New York, N. J. Folder describing the Metasealing process of impregnation for both cast and metal powder parts. 56

GEAR DRIVES—Falk Corporation, Milwaukee, Wis. Bulletin 7101, containing essential information on Falk shaftmounted drives for efficient speed reduction in limited space.

KNIFE GRINDERS-Hanchett Mfg. Co. Big Rapids, Mich. Catalogue on Hanchett knife grinders, dealing with construction, design, capacity, and types of drives. . 58

TITANIUM FOIL—Industrial Division, American Silver Co., Inc., Flushing, N. Y. Technical data sheet No. 100, describing titanium foil rolled to close tolerances and thin gages. .

POWER PRESSES—Kenco Mfg. Co., Los Angeles, Calif. Leaflet on 4- and 5-ton Rigid Rib presses designed for operations that require extreme rigidity for deepthroat punching.

HIGH-TEMPERATURE ALLOY-No. tional Alloy Division, Blaw-Knox Co., Pittsburgh, Pa. Folder descriptive of NA22H, an alloy for high-temperature applications up to 2200 deegrees F. . . 61

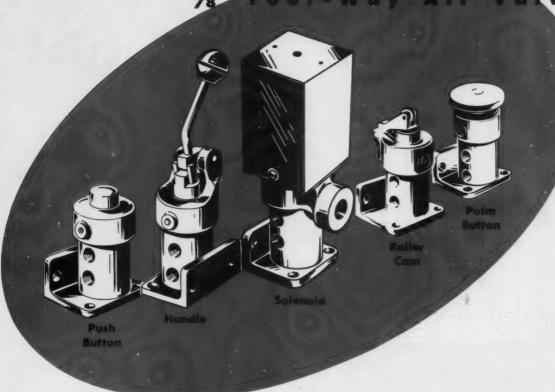
LOW-TEMPERATURE BRAZING-

SPRAY PAINTING—Despatch Oven Co., Minneapolis, Minn. Bulletin 66, descrip-tive of both water wash and dry paint spray booths.

AIR-POWERED VISES—Van Products Co., Erie, Pa. Folder describing VI-Speed air-powered bench vises and illustrating their versatility in various shop jobs. . . 64

Ross Pal

1/8" Four-Way Air Valve



- · Hand-Solenoid-Cam
- One Moving Part
- Heads Interchangeable
- May be Used as a Two-Way or Three-Way, Normally Open or Normally Closed
- Write Dept.110 for Bulletin 309A

Tomorrow's EnginAlRing Delivered Today



Ross

OPERATING NALVE COMPANY

120 E. GOLDEN GATE AVENUE . DETROIT 3 . MICHIGAN

Another Transfer-matic by Cross

350 Foot
Automation Line
Performs 555 Operations
on V-8 Cylinder Blocks

- *100 pieces at 100% efficiency.

 * Operations: 265 drilling, 6 milling, 21 boring, 56 reaming, 101 countersinking, 106 tapping, and 133 inspection.
- * 104 stations: 1 for loading, 53 for machining, 7 for part handling, 6 for mechanical inspection, 36 for visual inspection, 1 for unloading.
 - *5 independent machine sections with provision for banking parts between each section; master automatic cycle for operating all 5 sections simultaneously.
- Capacity for removing work piece at every
- Automatic independent transfer mechanism for each machine section and automation units for handling parts from machine section to machine section.
 - * Automatic air pressure testifor high pressure oil holes and automatic depth inspection for all holes before tapping.

 * Pre-set tooling throughout.
- A Other features: Coolant system for tapping section, complete interchangeability of all standard and special parts for easy maintenance, construction to J.I.C. standards, hardened and ground ways, hydraulic feed and rapid traverse, automatic lubrication, automatic chip disposal.

Established 1898

CO.

Special MACHINE TOOLS



For Five O'Clock Shadow, Too?

In September Machinery, an advertisement relating to grinding wheels uses sandpaper to represent the wheels, thus giving an abrasive illusion. One of our editors puts it to good use—opening the magazine to this page, he sharpens pencil points, trims hangnails, and smooths chair splinters.

Press Scoops

At the Buick press party staged recently to introduce the 1955 automobiles, a tank stored with trout proved an attraction. The idea was to catch your trout, tag it, and then eat it some hours later as one of the courses at the banquet. Our associate editor re-

ported, however, that the fish got smart and refused to bite after watching some of their close friends literally being hooked. The only alternative was to drag them out with nets if you wanted a fish on your dish.

Without Thinking or Blinking

A staff member reports that his youngster came home from school with this story—his teacher asked one of his classmates to use the word supervision in a sentence and got a fast answer: Superman has supervision.

Backlash

Unknowingly, we tampered with a lady's age in last month's

BG item "Baby Dear or Gear," in which we reported that a gear specialist had recently baptized his baby daughter Involute. Involute, we now learn, just graduated from college. This information comes to us from a reader who knows the family and signs himself "Yours for Accuracy."

Ups and Downs

Flexible steel wire rope with a built-in temperature indicator is being produced by the Jones & Laughlin Steel Corporation for use in detecting deterioration in stored grains, since areas affected by moisture or insects will heat. In line with this (?), we were reading about a swizzle stick with a built-in thermometer. Insert it in a glass of liquid grain and watch the temperature.

BEADS OF FRIENDSHIP—This could be the title of the book held by A. F. Davis (right), vice-president and secretary of the Lincoln Electric Co., Cleveland, Ohio, and just presented to him by J. F. Lincoln (left), chairman of the board. The occasion was the fortieth anniversary of Mr. Davis with the company and the leather-bound book contained congratulatory letters from more than 250 of his associates. Mr. Davis has operated the Lincoln Welding School since 1917 and published, since 1926, the Stabilizer, a magazine which is sent to welders all around the world. He is also secretary of the James F. Lincoln Arc Welding Foundation, which was created by the company in 1936.



MACHINERY, November, 1954-271

MOUNT OF THE INDUSTRY

California

RANDOLPH E. BAILEY and ROBERT P. MARKS have been appointed to the sales engineering staff of the San Jose Division, San Jose, Calif., of the E. W. Bliss Co., Canton, Ohio. Both men will represent the Die Supply Co., a Bliss subsidiary and manufacturer of Dieco die sets and diemakers' supplies. Mr. Bailey was formerly manager of the manufacturing control department at the Pacific Airmotive Corporation, Burbank, Calif., while Mr. Marks was a sales engineer with the Pacific Foundry Co., San Francisco.

F. A. Henry has been appointed general manager of the Pacific Coast Works, Los Angeles, Calif., by the A. O. Smith Corporation, Milwaukee, Wis. Mr. Henry was formerly assistant to the general manager at Milwaukee. The California plant produces meters for measuring the flow of hydraulic pumps, pressure vessels, and petroleum products.

ENGINEERED INSTRUMENTS, INC., Haywood, Calif., have taken over the facilities and operations of D-V Welding Controls, Oakland, Calif. The latter company's products will now be manufactured and handled by the D-V Control Division at the Haywood plant. George C. Lydiksen will head sales.

HAROLD C. JENSETH has been appointed plant manager of the San Francisco, Calif., plant by the distribution assemblies department of the General Electric Co., Plainville, Conn. Mr. Jenseth has been with G-E since 1945.

A. SCHRADER'S SON, Brooklyn, N. Y., pneumatic valve manufacturer, announces that its California branch is moving to larger quarters at 6464 Flotilla St., Los Angeles 22, Calif.

BURG TOOL MFG. Co., INC., has completed a new plant for the manufacture of Burgmaster turret drills and tool-holders, located at 15001 S. Figueroa St., Los Angeles, Calif.

Indiana and Illinois

CARL J. MEISTER has joined the Atkins Saw Division, Indianapolis, Ind., of the Borg-Warner Corporation, Chicago, Ill., in the capacity



Carl J. Meister, vice-president sales of the Atkins Saw Division, Borg-Warner Corporation

of vice-president—sales. Mr. Meister was formerly vice-president and director of sales for the Atlas Chain & Mfg. Co. and has had an extensive background in the manufacture and sales of industrial and hardware products.

C. K. McCullough Co., Inc., is a company newly organized by Caroll K. McCullough, specializing in the production of automatic governors and controls. The concern is located at 1307 E. Cross St., Anderson, Ind. Mr. McCullough was formerly president of the Pierce Governor Co., also of that city.

JOHN S. BARNES CORPORATION, Rockford, Ill., recently opened a factory branch office at 2333 W. Wells St., Milwaukee, Wis. Bert MCCLENEGHAN, manager of the Chicago sales office will supervise the Milwaukee office. Associated with him in Chicago will be KEITH STRUTHERS. Mr. Struthers has had several years' experience as a sales engineer for Barnes.

SIZE CONTROL Co., Chicago, Ill., and its affiliate, WACKER SALES, both of the American Gage & Machine Co., have had their territory extended by Riehle Testing Machines, a division of American Machine & Metals, Inc., to Iowa, northern II-

linois, and northeastern Indiana. They were previously representatives in Wisconsin and Minnesota, through sub-agents, for Riehle portable hardness testers.

PRESSED STEEL CAR Co., INC., New York City, has purchased the CLEARING MACHINE CORPORATION of Chicago, manufacturer of mechanical and hydraulic presses. This includes the plants in both Chicago, Ill., and Hamilton, Ohio. Clearing will operate independently as a division and its present management will be retained.

ROBERT INSLEY has become chief project engineer for the Aircraft Engine Division at Chicago, Ill., of the Ford Motor Co., Detroit, Mich. Mr. Insley, who succeeds the late Ralph N. DuBois, was formerly manufacturing vice-president of the Continental Aviation & Engineering Corporation, Detroit.

VIRGIL FORTNER has been appointed representative in the Chicago area for the Gorham Tool Co., Detroit, Mich., and will handle the complete line of Gorham standard cutting tools, as well as providing specialized engineering service. Mr. Fortner's offices are located at 5125 W. Central Ave., Chicago, Ill.

L. R. FARRELL has joined the High Frequency Division of the Lindberg Engineering Co., Chicago, Ill. Mr. Farrell, who will specialize in motorgenerator induction heating sales, was associated with the Tocco Division of the Ohio Crankshaft Co. for the last twelve years.

RAYMOND N. CARLEN has been appointed assistant to the vice-president in charge of operations for Joseph T. Ryerson & Son, Inc., Chicago, Ill. Mr. Carlen joined the company in 1946 and at the time of his promotion was assistant operating superintendent at the Chicago plant.

A. O. Wood has been named Chicago, Ill., district manager for the Tocco Division of the Ohio Crankshaft Co., Cleveland, Ohio. Mr. Wood, who has been with the company since 1929, was formerly Chicago district engineer.

Dow CHEMICAL Co., Midland, Mich., has opened an office at 3030 S. Ashland Ave., Chicago, Ill., to



per hour per machine!

You can't beat Revere Free-Cutting Brass for speed

The mounting nuts shown here are made by the Fischer Special Mfg. Co., Cincinnati 6, Ohio, out of Revere 9/16" hexagon Free-Cutting Brass Rod. Output is 4500 per hour per machine. This phenomenal rate of production is due to special adaptations of standard machines according to Fischer designs and the high quality of Revere Rod. These two important factors enable Fischer to compete price-wise with nuts produced by other methods.

Fischer nuts are chamfered and countersunk on both sides, have no burrs, and are made in sizes from 1/8" to 1-1/16", in various designs, such as hexagon, cap, thumb, spark plug terminal, lighting fixture. As a further indication of the efficiency of the Fischer operation it can be reported that during 1953 the company averaged 244,897 pieces per running hour.

If you machine brass, look into the virtues of Revere Free-Cutting Brass. See the nearest Revere Sales Office.

REVERE

COPPER AND RRASS INCORPORATED

Founded by Paul Revere in 1801 230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

FISCHER WAFER or mounting nuts, made from Revere 9/16"Free-Cutting Brass Rod at a rate of 4500 per hour.

Revere Free-Cutting Brass Rod has speeded production for many firms, and saved them money.



provide improved customer service for six states—Minnesota, Wisconsin, Iowa, Illinois, Indiana, and Michigan.

ARTHUR J. MILLER, JR., has been elected president and general manager of the Chicago Wheel & Mfg. Co., Chicago, Ill. He succeeded A. J. MILLER, SR., who was named chairman of the board.

Michigan

FRANK M. HAWLEY has been elected chairman of the board and STANLEY J. ROUSH, president and general manager, of the Morse Chain Co., Detroit, Mich., a subsidiary of the Borg-Warner Corporation, Chicago, Ill. Mr. Hawley was previously president and general manager of Morse Chain. Mr. Roush is also president of the Atkins Saw Division, Indianapolis, Ind., of Borg-Warner, a position which he has held since 1952 and will retain. The Morse Chain Co. operates two plants, one in Detroit and the other in Ithaca, N. Y.

GEAR GRINDING MACHINE Co., Detroit, Mich., recently announced executive changes for two subsidiaries. HERBERT S. RIES was elected president of the newly acquired Republic Gear Co., Detroit, Mich. Mr. Ries was formerly vice-president and director of sales for Republic, having been with this company since 1924. As president, he replaces the late THOMAS R. NAVIN. At the same time, EDGAR D. LEON was made president of the Detroit Bevel Gear Co., Detroit, Mich., which was a Republic subsidiary, also replacing Mr. Navin. Mr. Leon is president

of the Gear Grinding Machine Co. Mr. Ries was appointed to the board of directors of the parent company and the two subsidiaries. STERLING RICHHART was re-elected secretarytreasurer and director of both Republic and Detroit Bevel Gear.

CLARK EQUIPMENT Co., Buchanan, Mich., has acquired the torque converters made by the Torcon Corporation, Ashtabula, Ohio. Production operations for the manufacture of these converters will be transferred to Clark's transmission plant at Jackson, Mich., under the supervision of Roy McDermott, manager of the transmission division.

SAHLIN ENGINEERING Co., Detroit, Mich., is opening a new plant specializing in research and experimental activities on Automation Machinery at Birmingham, Mich. The company manufactures Iron Hand unloading machines and transfer machines for sheet-metal lines at Detroit, Flint, and Hazel Park. Engineering and general offices will also be located at the new plant.

WILLIAM BENNETT has been named a supervisor for the Hydraulic Division of the J. N. Fauver Company, Inc., Detroit, Mich. He will cooperate with the Flint and Grand Rapids offices.

WAGNER BROTHERS, INC., makers of metal-finishing equipment, have consolidated manufacturing operations in a new plant at 7800 Dix Road, Detroit, Mich.

LESTER-PHOENIX, INC., Cleveland, Ohio, has appointed M. R. TENENBAUM as representative in the Michigan Area. His headquarters will, however, be in Cleveland.





(Left to Right) Herbert S. Ries and Edgar D. Leon, presidents of Republic Gear Co. and Detroit Bevel Gear Co., respectively, subsidiaries of Gear Grinding Machine Co., of which Mr. Leon is also president

M. A. Burello has joined the product planning group of Carboloy Department of General Electric Co., Detroit, Mich. Mr. Burello will specialize in market development of vacuum-melted products. He was formerly associated with E. I. Du-Pont de Nemours & Co., Inc.

CLAYTON L. JONES has joined the Morse Chain Co., Detroit, Mich., a Borg-Warner industry, in the capacity of master mechanic. Mr. Jones was formerly vice-president—manufacturing for the Hage Industrial Corporation, Toledo, Ohio.

ROBERT L. BELL, formerly superintendent of metals for the Carboloy Department of General Electric Co., Detroit, Mich., has been appointed manager of manufacturing engineering. Mr. Bell has been with Carboloy since 1939.

JOHN R. Morrow has joined the Kaydon Engineering Corporation, Muskegon, Mich., as assistant sales manager of the Needle Roller Division.

New England

PHILIP H. DREISSIGACKER has been promoted to the position of assistant chief engineer by the Farrel-Birmingham Co., Inc., Ansonia, Conn. Mr. Dreissigacker has been with the organization since 1937 except for Army service. In 1952, he was appointed division engineer in the company's Sugar Mill Machinery Division.

TORRINGTON MFG. Co., Torrington, Conn., announces the change of name of its Spring Machinery Division to the Wire Forming Machinery Division.

ALPHA CORPORATION, Greenwich, Conn., manufacturer of industrial lubricants, is moving to 65 Harvard Ave., Stamford, Conn.

Louis S. Kutscher has been appointed sales manager by the Barnaby Mfg. Co., Bridgeport, Conn.

HAROLD J. CHASE has been appointed manager—engineering of the Small Turbine and Supercharger Department, Fitchburg, Mass., by the General Electric Co., Schenectady, N. Y. Mr. Chase joined G-E as a test engineer in 1924, and after various assignments became manager—marine turbine sales in the Department at Fitchburg.

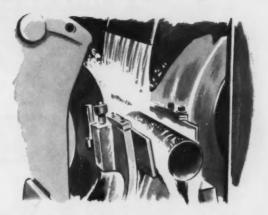
HAROLD WRIGLEY has been named works manager, and CHARLES S. BASNEY, new products manager, of the Barry Corporation, Watertown, Mass., manufacturer of shock and vibration isolation equipment.

(Continued on page 279)

New S.E.C.O. is Tops For These Operations



CUTTING WITH NEW S.E.C.O. Tools stay cool—require less frequent grinding. Finishes are uniformly good.



GRINDING WITH NEW S.E.C.O. Surface finishes are good. Loading and glazing of wheel are reduced—wheel life is prolonged.



WASHING WITH NEW S.E.C.O. Thorough removal of grease and dirt provides clean surfaces for smooth, long-lasting finishes.



ROLLING WITH NEW S.E.C.O. Rolls stay clean. You get maximum reductions and low power consumption.

New Sunoco Emulsifying Cutting Oil increases production, cuts operating costs. Its high machining efficiency permits uniformly good finishes, prolongs tool life. Its high detergency and purity keep tools, parts and machines clean. Its excellent mixing qualities permit its use in cold, hard or hot water. Test New S.E.C.O. in your own plant. For more information, call your nearest Sun office or write Sun Oil Company, Philadelphia 3, Pa., Dept. M-11.

SUN OIL COMPANY



PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL Refiners of famous High-Test Blue Sunoco Gasoline

again with the finest Startett announces

the NEW no. 221 hi-PRECISION MICROMETER

READS DIRECT IN TEN-THOUSANDTHS WITH AUTOMATIC SPINDLE PRESSURE CONTROL

DISTRIBUTOR

With this new Starrett hi-PRECISION Micrometer, anyone can measure with the speed and accuracy of an experienced gage-maker. It reads direct in ten-thousandths of an inch - no Vernier to decipher. It makes every measurement with consistent spindle pressure - no relying on "feel".

Starrett No. 221 hi-PRECISION OUTSIDE MICROMETER CALIPER
Range 0-1" by .0001"

The new No. 221 features the patented Starrett hi-PRECISION thimble with direct reading ten-thousandths graduations plus an exclusive constant-pressure mechanism which automatically insures exact spindle pressure on every measurement. Use it for faster measuring at top accuracy, for inspection and quality control applications and for all precision measuring requiring consistent, high precision.

The new Starrett No. 221 hi-PRECISION Micrometer is now available as a 0 to 1 inch outside caliper. Ask your industrial distributor to demonstrate its advantages and superior accuracy . . . or write for complete information. Address Dept. D.



DIRECT TEN-THOUSANDTHS READINGS

The patented Starrett hi-PRECISION Micrometer features dual thimbles. The inner thimble with every thousandth numbered for positive identification is used to read thousandths in the conventional way. The outer thimble with large, widely spaced, numbered graduations gives direct readings in ten-thousandths.



"WORLD'S GREATEST TOOLMAKERS"

TOOLS AND PRECISION INSTRUMENTS - DIAL INDICATORS - STEEL TAPES
PRECISION GROUND PLAY STOCK - HACKSAWS, BAND SAWS and BAND KNIVES THE L. S. STARRETT COMPANY, ATHOL, MASSACHUSETTS, U. S. A.

Visit the Starrett Exhibit . BOOTH 2101

NATIONAL METAL EXPOSITION . Chicago, December 8-10

MACHINERY'S DATA SHEETS 765 and 766

PRESSURE IN TONS PER LINEAR FOOT REQUIRED FOR ANGLE BENDING*-3

Table Gives Pressures for "Air Forming" Method Used on Press Brake Employing Dies Having Die Member Openings of Different Widths

Thickness of Metal			Width of Opening in Die Member, Inches													
Gage or Size	Inch	5/16	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2		
20	0.0359	1.96	1.65	1.13	0.89											
18	0.0478		2.8	2.04	1.63	1.32										
16	0.0598		5.6	3.75	2.64	2.14	1.79	1.53								
14	0.0747			5.62	4.61	3.37	2.87	2.48	2.16	1.92						
13	0.0897				6.42	5.15	4.24	3.65	3.18	2.79						
12	0.1046				9.83	7.0	5.98	4.8	4.2	3.8	3.1					
11	0.1196			****		11.1	8.1	6.8	5.9	5.25	4.2	3.5	3.3	3.		
10	0.1345					1	10.5	8.8	7.6	6.7	5.4	4.5	4.2	3.		
9	0.1495						15.0	11.8	9.6	8.5	6.8	5.7	5.3	4.		
3/16	0.187								18.6	14.0	11.2	9.4	8.6	8.		
7/32	0.218							****		22.4	15.8	13.1	12.4	11.		
1/4	0.250									24.2		17.8	16.2			
		K + 4 +		****		* * * * *	2222		****	****	24.4			14.		
9/32	0.281	***	***	****			****		****	****		26.5	21.0	19.		
5/16	0.312	****	****	****		****			***		****		30.4	26.		
11/32	0.343			****										34.		

*The bending pressures given in chart are for mild steel having tensile strength of 60,000 pounds per square inch. For soft brass and soft aluminum, take 50 per cent of pressure given in table. For stainless steel, take 50 per cent more, and for chromium-molybdenum, 100 per cent more pressure than that given for mild steel.

O

Notes: Pressures shown in bold-face type are for dies with openings approximately eight times as wide as the thickness of the metal to be formed and a punch member with a radius equal to the thickness of the metal. These proportions are considered ideal for right-angle bending.

For additional instructions see Data Sheets Nos. 763 and 764.

MACHINERY'S Data Sheet No. 765, November, 1954

Compiled by Verson Allsteel Press Co., Chicago, Illinois

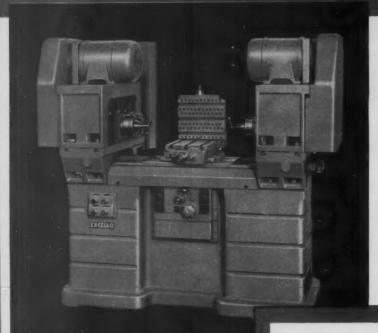
PRESSURE IN TONS PER LINEAR FOOT REQUIRED FOR ANGLE BENDING-4

Table Gives Pressures for "Air Forming" Method Used on Press Brake Employing Dies Having Die Member Openings of Different Widths

Thickness	of Metal				Width of	Opening in	Die Memb	er. Inches			
Gage or Size	Inch	2 1/4	2 1/2	2 5/8	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/
9	0.1495	4.3	3.8								
3/16	0.187	6.9	6.3	5.9	5.6	5.0					
7/32	0.218	9.8	8.6	8.1	7.7	7.0	6.4	5.9			
1/4	0.250	13.0	11.5	10.9	10.3	9.3	8.5	7.8	7.3	6.7	
9/32	0.281	16.9	14.8	14.0	13.3	12.0	11.0	10.5	9.36	8.7	7.6
5/16	0.312	21.5	18.6	18.0	16.5	15.0	13.7	12.6	11.6	10.8	9.
11/32	0.343	28.1	23.3	21.7	20.5	18.3	16.8	15.5	14.2	13.2	11.
3/8	0.375	36.6	28.4	26.5	24.8	22.5	20.2	18.6	17.2	16.1	13.5
13/32	0.406		38.7	33.8	30.2	26.6	24.2	22.2	20.5	19.0	16.
7/16	0.437			42.8	41.0	31.7	28.7	26.3	24.2	22.4	19.0
15/32	0.468				47.0	39.5	33.6	30.4	28.0	26.0	22.
1/2	0.500					49.0	41.6	35.5	32.5	29.9	26.
17/32	0.531						51.2	43.7	37.5	34.3	29.
5/8	0.625	*****	*****			*****	*****	*****	61.3	52.8	43.
11/16	0.687						*****			69.2	55.
3/4	0.750						*****				73.

Note: For instructions in use of this Data Sheet see Data Sheets Nos. 763, 764, and 765.

To Meet Today's Price-Competition Modernize with Ex-Cell-O Machines



Standard Precision Boring Machines for Close-Tolerance Work at MAXIMUM PRODUCTION SPEEDS

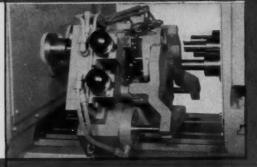
Style 1212-A Precision Boring Machine equipped with spindles, drive mechanism, and universal fixture. Like all other Standard Ex-Cell-O Boring Machines, it can be tooled with special fixtures for high production runs.

flanges for a new 4-barrel automotive carburetor require accurate bores. The four holes are 1%" diameter, bored to plus-or-minus .0005". It's done at maximum production speeds on this standard double-end Ex-Cell-O 1212-A Precision Boring Machine using a simple fixture holding two parts.

Ask your local Ex-Cell-O representative for more information or write for Precision Boring Catalog.







The four holes are so close together that they cannot be bored simultaneously. So two holes in each part are machined by spindles at left; then, two holes in each by spindles at right. With minor changeovers, this same fixture handles similar parts of different shapes.

EX-CELL-0

CORPORATION DETROIT 32, MICHIGAN MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

JOHN M. HORVATH has been appointed a direct factory representative for the Hy-Pro Tool Co., New Bedford, Mass., and will cover metropolitan New York City and northern New Jersey.

RAYMOND H. MATTHEWS was recently appointed chief engineer of Fenwal, Inc., maker of thermostats and temperature controllers, Ashland, Mass. He was formerly assistant chief engineer.

F. STEELE BLACKALL, III, was recently elected a vice-president of the Taft-Peirce Mfg. Co., Woonsocket, R. I. Mr. Blackall is also assistant treasurer and a director of the company.

New York and New Jersey

TURBINE EQUIPMENT Co., New York City, has advanced HAROLD SINCLAIR from president to chairman of the board and Donald F. MILLER from executive vice-president to president. PAUL E. LINTH-WAITE, formerly a sales engineer, has been made vice-president in charge of machinery sales. The company is a sales representative for the De Laval Separator Co. and other companies, as well as a manufacturer of Hynes electric heating equipment.

GEORGE W. BELCHER has been appointed central district manager of sales and technical service by the Titanium Metals Corporation of America, New York City. He will be located at the Chicago office. WARD W. MINKLER has been named assistant manager of market development, with headquarters at the general sales office in New York City. Mr. Minkler was formerly Pacific Coast manager of sales and technical service.

SENECA FALLS MACHINE Co., Seneca Falls, N. Y., has recently formed an Electronics Division. Robert H. EISENGREIN has been appointed director of the new division. He already is credited with four electronics patents and comes to Seneca Falls from Sunstrand Aviation, where he was chief research engineer responsible for analysis, development, and design of automatic control systems and components.

WILLIAM W. KUYPER has been appointed manager—manufacturing engineering in the large steam turbine-generator department of the General Electric Co., Schenectady, N. Y. Mr. Kuyper, who joined General Electric in 1933, has held various posts. He was assigned to the engineering staff of the apparatus sales division in 1945; two years later to the medium steam turbine, generator, and gear department; and



William W. Kuyper, G-E manager manufacturing engineering in large steam turbine-generator department

in 1951, to the Knolls Atomic Power Laboratory in Schenectady as manager of engineering and production. Last year he joined the engineering staff of the large steam turbinegenerator department as project engineer for the new turbine development laboratory.

WILLIAM J. DURING, head of Precision Castings Co., Inc., Syracuse, N. Y., was recently elected president of the American Die Casting Institute at its annual meeting in Chicago. G. M. ROLLASON, of the Aluminum Company of America, Pittsburgh, Pa., who was retiring president and a director of the Institute for the last twenty-five years, was cited for leadership in encouraging new die-casting advances.

WALTER E. MAX has been appointed general superintendent of the Buffalo Works, Buffalo, N. Y., of the Worthington Corporation, Harrison, N. J. Mr. Max was formerly manager of the Buffalo service and erection department, a position which will now be filled by HARRY P. YOUNT. JOHN J. HOEFNER succeeds Mr. Yount as assistant manager of the department mentioned.

WALTER H. PRINE has been named head of the electroplating-chemical-catalyst section of the nickel sales department by the International Nickel Co., Inc., New York City. Mr. Prine joined the company in 1945.

BART MFG. Co., Belleville, N. J., recently announced the purchase of the DETROIT DIE CASTING & PLATING Co., Detroit, Mich. Facilities are being expanded there for bright goldplating to specification, as well as for die-casting, finishing, and plating copper, nickel, and chromium.

ADAMAS CARBIDE CORPORATION, Kenilworth, N. J., has appointed the following sales representatives: PIERCE FRAUENHEIM, 4920 Penn Ave., Pittsburgh, for western Pennsylvania; Don R. Manecke, 739 N. Broadway, Milwaukee, for Wisconsin; and R. C. Dombrow Co., 5221 W. Belmont Ave., Chicago, for both northern Illinois and northern Indiana.

TOM W. BURNES, a sales engineer on the home office staff of the John S. Barnes Corporation, Rockford, Ill., has been assigned to the Trenton, N. J., office. Mr. Burnes will represent the company in the New England division of the eastern territory.

LEO BUCHINE has been named vice-president and general manager in charge of manufacturing at the Industrial Washing Machine Corporation, Matawan, N. J., manufacturer of specially designed machines for cleaning metals.

John B. Moore Corporation, producer of industrial solvents, is moving into larger quarters in the Peerless Bldg., 384 Franklin Ave., Nutley, N. J. The company is retaining its mailing address of Box 3, Nutley 10, N. J.

EDGCOMB STEEL CORPORATION, Hillside, N. J., distributor of steels and aluminum has changed its company name to EDGCOMB STEEL & ALUMINUM CORPORATION.

Ohio

ROBERT J. HIRSCH has been appointed district sales manager to head the North Haven, Conn., office of the Lincoln Electric Co., Cleveland, Ohio. He will be responsible for the sale of Lincoln arc-welding machines and electrodes in Connecticut. Mr. Hirsch was formerly an applications engineer in the Pittsburgh district. Also announced was the appointment of RICHARD P. LINDGREN as district manager in Moline, Ill., in charge of sales for northwestern Illinois and central and eastern Iowa. Mr. Lindgren joined Lincoln Electric in 1947, and at the time of his appointment was manager of the North Haven office.

AKRON GEAR & ENGINEERING Co., Akron, Ohio, manufacturer of gears, sprockets, and similar products, has acquired POWERMATIC, INC., of the same city. The pumps, rams, and arbor presses formerly manufactured by the acquired company will now be produced by the Akron Gear & Engineering Co.

EDWARD J. GESDORF has been named senior application engineer of the Farval Corporation, Cleve-



Edward J. Gesdorf, who is senior application engineer of the Farval Corporation

land, Ohio, manufacturer of centralized systems of lubrication for industrial machinery. Mr. Gesdorf has served the company since 1932 on various engineering assignments in both factory and field operations. Last year he was made service manager.

WILLIAM D. MATHERS has been named assistant manager of forging sales by the Aluminum Company of America, Pittsburgh, Pa. His head-quarters will be in the Cleveland plant. Mr. Mathers joined the American Magnesium Corporation, an Alcoa subsidiary, in 1941.

CHARLES E. VANDERPOOL has been promoted to the position of sales manager of the Rotor Tool Co., Cleveland, Ohio. Mr. Vanderpool, who joined the company in 1947, was formerly sales promotion and advertising manager.

ASSEMBLY PRODUCTS, INC., Chagrin Falls, Ohio, builders of moving coil relays, are moving into a larger plant located at the intersection of County Line Road and Wilson Mills Road, Chesterland, Ohio.

HEBER L. NEWELL has joined the Denison Engineering Co., Columbus, Ohio, in the capacity of assistant general manager. Mr. Newell was formerly general manager of the Barrett-Cravens Co., Chicago, Ill.

GEORGE W. STAIGER has been appointed a representative by the Weldaloy Products Co., East Detroit, Mich. With headquarters in Cleveland, Mr. Staiger will cover Ohio and western Pennsylvania.

PETERSON NESBIT and ALBO D. BUA, application engineers in the Reliance Electric & Engineering Co.,

Cleveland, Ohio, have been given new assignments. Mr. Nesbit will be in the New York City district sales office, and Mr. Bua in the Newark, N. J., office.

ROBERT E. MINTO has been named chief metallurgist in the Cleveland Works Division, Cleveland, Ohio, by the Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

Pennsylvania

FIRTH-LOACH METALS, INC., Mc-Keesport, Pa., is a newly organized company specializing in carbide metal. L. GERALD FIRTH, who resigned from Firth Sterling, Inc., last October, is president. WILLIAM J. LOACH, who was formerly manager of research and development in the Powdered Metals Division of Firth Sterling, Inc., will be vicepresident and general manager. Other executives are CHARLES E. Young, chairman of the board and treasurer; Louis DEMARCO, vicepresident of sales and engineering; JAMES E. GRAY, sales manager; JACK H. POWERS, superintendent of metallography; WILLIAM C. SEITZ, manager of research and development; HAROLD O. WARNOCK, chief plant engineer; and ROBERT C. LINDBERG, superintendent of production. HENRY J. SCHMIDT is carbide engineer. The address of the plant is Buttermilk Hollow Road, West Mifflin Borough, McKeesport.

FIRTH STERLING, INC., Pittsburgh, Pa., has appointed three new distributors: E. C. BLACKSTONE Co.. Memphis, Tenn., and FARQUHAR MA-CHINERY Co., Jacksonville, Fla.both to market Firthite tools, tips, and blanks; high-speed tool-holder bits, drill rod, and ground flat stock and KALAMAZOO MILL SUPPLY Co., Kalamazoo, Mich., to distribute the line of Firthite tools, tips, and blanks. The company also announced that ATHOS STEEL SERVICE will handle the Firth Sterling line of tool and die steels, tool-holder bits, drillrod, and flat stock in Philadelphia and eastern Pennsylvania.

GENERAL ELECTRIC Co., Schenectady, N. Y., opened its welding plant at York, Pa., on October 21, marking the occasion with an open house. The welding department was formerly located at Fitchburg, Mass., but moved its entire manufacturing and administrative facilities to York early this year. The plant is head-quarters of G-E welding products—alternating-current transformer, direct-current rectifier, direct-current motor-generator, and direct-current engine welders.

C. D. GALLOWAY, SR., has joined the Chambersburg Engineering Co., Chambersburg, Pa., manufacturer of hammers and other forging equipment, as special consultant on automatic handling systems for the Chambersburg Impacter. For thirty-four years, Mr. Galloway was associated with the Electric Storage Battery Co., Philadelphia, Pa., from which he retired in 1951 as factory engineer for all plants, although being retained as advisor on mechanical processes.

EDWARD A. LORIA has been appointed staff metallurgist at the Crucible Steel Company of America, Pittsburgh, Pa. Mr. Loria, who has been assigned to the central metallurgical office in Pittsburgh, will work in the field of stainless and heat-resisting materials for aircraft, automotive, and power generating applications. He was formerly associated with the Carborundum Company, Niagara Falls, N. Y. as senior metallurgist.

LUKENS STEEL Co., Coatsville, Pa., has promoted the following men in its Sales Division: W. HARRISON LACKEY, former manager, plate sales, is the new manager, field sales; CHARLES A. CARLSON, JR., who was assistant manager in the New York district office, advances to manager, carbon plate sales; and ROBERT L. CAHOON, former assistant manager, clad and foreign conversion, becomes manager, alloy plate sales.

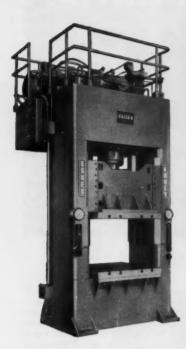
CARL HAMMON has been appointed manager of the Hydraulic Press Division of the Erie Foundry Co., Erie, Pa. Also announced was the appointment of the following representatives: STANLEY BERG & Co., Frick Bldg., Pittsburgh, Pa., representing the company in the Pittsburgh area; and BERT CARPENTER Co., Briggs Bldg., Birmingham, Mich., in the Detroit area.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., has put into production a new tandem cold-rolling mill at its Brackenridge, Pa., plant. This completes a nine-year rebuilding and expansion program in which the concern has spent \$96,000,000.

ALFRED B. DRASTRUP, executive vice-president of A. M. Byers Co., Pittsburgh, Pa., producer of wrought iron, has been elected president. He succeeds L. F. RAINS, who is retiring after twenty-three years as president and a director of the company.

INDUCTOTHERM CORPORATION is a newly formed company devoted to the manufacture of induction melting and heating equipment, and will be located at 620 Glenolden Ave., Glenolden, Pa. HENRY M. ROWAN and PAUL F. FOLEY are officers.

WILLIAM L. LUTES has been appointed manager of the hard-surfacing department of the Electrode



DRAWING AND FORMING PRESS

Typical of Elmes soundly designed and constructed hydraulic equipment for metal drawing and forming is the press shown above. These presses are built in single and double-action types (with or without cushion) and in triple-action type. Equipped with push-button controls arranged for semi-automatic or full automatic operation, and inching for diesetting. Rapid traverse to and from work, automatic slow-down, and protection against over-travel and over-pressure. Wide range of pressure capacities, from 50 to 2000 tons or more.

Elmes versatility in the metalworking field is illustrated by the presses shown here—just a few of the many types available. Whatever your job requirements, skilled Elmes engineers are ready at all times to help you solve your hydraulic equipment problems on the traditional Elmes basis of maximum production efficiency at minimum cost.



Double-End TUBE REDUCING PRESS

Another Elmes entry into the growing field of automation. Fully automatic, including feed, tube ejection, and take-away, and lubrication of tube ends prior to reduction. Press illustrated is designed to accommodate a wide range of tubing lengths.



AUTOMATIC OPENSIDE PRESS

This specially designed press accomplishes in a single stroke the shearing, riveting, and straightening of forged steel work of variable thicknesses. Openside presses available in standard and special designs.



HOBBING PRESS

For die-sinking and hobbing — forming duplicate die inserts, multi-cavity molds, and single molds with unusual contours. Capacities to 5000 tons.

Write for Bullotin 1010-B

Illustrates, describes, and gives major specifications on Elmes Hydraulic Metal-Working Presses. See your Elmes Distributor — or write to us direct.



DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS



AMERICAN STEEL FOUNDRIES

ELMES ENGINEERING DIVISION

hydraulic presses and equipment 1162 TENNESSEE AVE., CINCINNATI 29, OHIO

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-281

Division of the McKay Co., Pitts-burgh, Pa., in the York, Pa., plant.

Texas, Arizona, and Arkansas

JONES & LAUGHLIN STEEL CORPORATION, Pittsburgh, Pa., recently announced plans for constructing a new Container Division plant at West Port Arthur, Tex., on the same property as the present plant, which will be used as a warehouse.

GARRETT CORPORATION, Los Angeles, Calif., announced a \$400,000 project to improve its AiResearch plant at Phoenix, Ariz.

EASTERN METAL PRODUCTS CORPORATION, Tuckahoe, N. Y., small appliance manufacturer, has completed plans for a plant located at Fort Smith, Ark., to serve the Midwest and Far West.

Washington, Colorado, and Iowa

HARRY E. ANDERSON has been appointed Seattle, Wash., plant representative for the Ryertex-Glyco Division of Joseph T. Ryerson & Son, Inc., Chicago, Ill.

LLOYD R. PAIST has been made assistant manager of the Denver, Colo., branch sales office by the Crucible Steel Company of America, Pittsburgh, Pa. Mr. Paist has served the company in Denver since 1926.

RUDOLF TORBICO has joined the Carboloy Department of General Electric Co., Detroit, Mich., as a field sales representative. He will make his home in Davenport, Ia.

Annual Index to

The annual index to Volume 60 of MACHINERY (September, 1953, to August, 1954, inclusive) is now ready for distribution. Subscribers who have not previously requested copies can obtain them without charge by writing to MACHINERY, Circulation Department, 148 Lafayette St., New York 13, N. Y.

* * * Stainless Gives Strength

Although its own weight is only 300 pounds, a newly-designed aircraft engine nacelle barrel supports a 3500-pound engine. The nacelle's high strength is made possible by the use of chromium-nickel stainless steel throughout its construction.

Obituaries

Milton O. Cross, Sr.

Milton O. Cross, Sr., founder of The Cross Company, Detroit, Mich., machine tool builder, died suddenly on September 25 at seventy-eight years of age. Mr. Cross started the present company in 1898, and when automobile production got into full swing a few years later, the organization was one of the few manufacturers equipped for cutting gears, and became a chief supplier for



Milton O. Cross, Sr.

Ford, Chevrolet, and many other car producers. During World War I, the company switched from supplying gears to supplying machines to make the gears, thus entering the machine tool business. In addition to his interest in his business, Mr. Cross was an ardent sailor and skippered boats to several championships. He also promoted sailing in the Detroit area and taught scores of youngsters the sport. Mr. Cross is survived by two sons and two daughters. Milton O. Cross, Jr. has been president of the company for many years, and Ralph E. Cross, executive vice-president.

GILBERT HALLER TURNER, director of industrial relations for the Timken Roller Bearing Co., Canton, Ohio, died on October 9 at the age of forty-eight years. Mr. Turner had been with Timken for twenty-six years, and became director of industrial relations in 1948.

RICHARD L. ROSSIN, a partner in the Stanat Mfg. Co., Long Island City, N. Y., maker of metal processing machinery, died of a heart attack on September 24 at the age of forty-six years.



Gerard M. Freeman

Gerard M. Freeman

Gerard M. Freeman, executive vice-president of Supreme Products, Inc., Chicago, Ill., died on September 23 in his Chicago home at the age of thirty-seven years. Mr. Freeman attended Brooklyn College and after serving in the United States Navy during World War II, he and a group of associates founded Supreme Products, Inc. He developed the Supreme brand chuck and a number of related items, as well as small appliances. Mr. Freeman also became known as a contract manufacturer of screw machine products. He is survived by his wife and three children.

DANIEL C. EIPPER, chief design engineer of the Moline Tool Co., Moline, Ill., died on September 21 at the age of sixty-one years. Mr. Eipper was with the company for thirty-five years, having begun as a patternmaker. He is survived by his wife, two sons, and a daughter.

Negotiations Completed to Buy Clearing Machine Corporation

Negotiations have been completed for the purchase of the Clearing Machine Corporation, Chicago, Ill., by the Pressed Steel Car Co., Inc. The purchase price will be between \$9,000,000 and \$10,000,000 of which \$5,300,000 will be paid in new convertible debentures and the balance in cash. Under the terms of the acquisition the Pressed Steel Car Co., Inc., will acquire the Clearing plants in Chicago, Ill., and Hamilton, Ohio. The Clearing business will be operated as an independent division with the present management personnel.

CONTINENTAL COUNTERBORES

INTERCHANGEABLE WITH A

Twist of the Wrist





Continental Counterbores may be purchased individually or in sets. Selection of three sets available. Write for new Counterbore Catalog.



THESE FEATURES WILL SAVE YOU TIME AND SAVE YOUR TOOLS:

Hand Detachable—one quarter turn by hand, a twist of the wrist engages or releases cutter.

Balanced Drive—double lugs on cutter engage double abutments in holder; double aligning bearings for rigidity.

Extra Torsional Rigidity—drive lugs are close to seating shoulder of cutter. **Practically Indestructible**—driving forces apply compression, not shearing action.

Right or Left Hand—one quarter turn locks or releases either right- or left-hand cutters.

Outside of Holder Free from Obstructions—obtainable for piloting in bushing, fluted to remove chips or threaded for stop nuts or collars.

The Continental Drive is available in standard counterbores, spot facers, countersinks, and also on special tools such as multiple-diameter cutters, step counterbores, radius and chamfering applications. It is equally applicable for inverted operations. Order through your Ex-Cell-O representative or direct from Continental Tool Works in Detroit.



Other Continental Products: Standard and Special Cutting Tools, Broaches and Broach Fixtures.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation, Detroit 32, Michigan

New Books and Publications

THE LIGHT METALS HANDBOOK (Two Volumes). By George A. Pagonis. 382 pages, total, 6 1/4 by 9 1/4 inches. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York City. Price, \$8.50.

This book is published in two volumes-Vol. I comprises the text and Vol. II consists of the tables to be used simultaneously with the text. There is a slip-cover arrangement so that the two books may be carried as a unit. Concise, yet complete, analysis of aluminum and magnesium alloys is presented from which correct selection can be made by comparison of alloying stabilities and chemical reaction characteristics, and by following through the procurement stages to actual testing. The book was written to serve aircraft, industrial, and civil engineers; fabricators; light-metal foundries; and men developing engineering specifications.

The first volume contains two parts. Part I, Magnesium and Magnesium-Base Alloys, considers the following subjects: classes, mechanical and physical properties, mechanical properties at elevated and low temperatures, detailed properties of individual compositions, choice of alloy, casting characteristics, formability, heat-treatment, corrosion, machinability, and joining methods. The second part considers aluminum and aluminum-base alloys, following the same treatment.

STRENGTH AND RESISTANCE OF MET-ALS. By John M. Lessells, 450 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Price, \$10.

The aim of this volume on the strength and resistance of metals is to provide the senior and graduate student, as well as the design engineer, with information on the behavior of metals under stress as it has been revealed by numerous workers in this field. Most of the discussion centers around the behavior of steel, but mention is made of non-ferrous alloys and cast iron in those particular instances where their behavior differs from that of steel. The book has a number of illustrative problems, and additional problems bearing on the subject matter of each chapter are included at the end.

Chapter headings are as follows: Tension; Elastic-Stage Modification; Tensile Properties at Elevated Temperatures; Hardness; Impact; Fatigue—Normal Conditions; Fatigue—Controlling Factors; Fracture of Metals; Strain Hysteresis; Mechanical Wear; and Theories of Strength and Working Stresses. ORGANIC FINISHING HANDBOOK (1954 Edition). 298 pages, 5 by 8 inches. Published by Finishing Publications, Inc., 381 Broadway, Westwood, N. J. Price, \$2 (paper-bound).

The last five years have so changed the outlook in the industrial finishing field that this volume is not just a revision of the 1949 issue, but practically a rewritten book. The handbook consists of articles on many timely subjects, all especially written by outstanding men in the field. The material has been organized into five principal sections. The first contains information on raw materials used in the formulation of modern finishes; and the second describes the surface treatment of metals and outlines the various methods for the application of finishes. In the third section, industrial finishes have been covered in a broad sense. Methods for testing finishes are outlined in the fourth section, while the last consists of an appendix covering such topics as safety, definition of terms, calculation data, and economic information.

HYDRAULIC PRESS ENGINEERING STANDARDS—SECTION V—GLOSSARY OF TERMS. 33 pages, 8 1/2 by 11 inches. Published by the National Machine Tool Builders' Association, 2071 E. 102nd St., Cleveland 6, Ohio. Price, 75 cents (paper-bound).

This glossary of engineering terms is the work of a twenty-one-man committee representative of as many manufacturers of hydraulic presses. It covers all types of hydraulic and compression molding presses, frame elements, cylinders, press control systems and components, pumps, and controls. In addition, several pages each have been given to accumulators, hydraulic valves, and fluid media.

FUNDAMENTALS OF FRICTION AND LUBRICATION IN ENGINEERING. Published by the American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill. Price, \$3.50 (paper-bound); \$3 to ASLE members.

Twelve informative papers that constituted the Proceedings of the first National Symposium of the American Society of Lubrication Engineers. Complete bibliographies with over 300 references are included.

Coming Events

NOVEMBER 1-5—Thirty-sixth National Metal Exposition sponsored by the AMERICAN SOCIETY FOR METALS at the International Amphitheatre, Chicago, Ill. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

NOVEMBER 1-5—National fall meeting of the AMERICAN WELDING SOCIETY to be held at the Sherman Hotel, Chicago, Ill. Further details can be obtained by writing to the Society, 33 W. 39th St., New York 18, N. Y.

NOVEMBER 15-17—Tenth annual meeting of the MAGNESIUM ASSOCIATION to be held at the Hotel Chase, St. Louis, Mo. Executive secretary, Jerry Singleton, 122 E. 42nd St., New York 17, N. Y.

NOVEMBER 18-19—Ninth Midwest Quality Control Conference sponsored by the AMERICAN SOCIETY FOR QUALITY CONTROL to be held at the Baker Hotel, Dallas, Tex. D. B. Tallon, chairman, Publicity and Promotion Committee, Ninth Midwest Quality Control Conference, 4220 Patricia St., Fort Worth, Tex.

NOVEMBER 29-DECEMBER 2—First INTERNATIONAL AUTOMATION EXPOSITION to be held at the 244th Regi-

ment Armory, New York City. For further information, write to Exposition, 845 Ridge Ave., Pittsburgh 12, Pa.

DECEMBER 2-7—Twenty-first National Exposition of Power and Mechanical Engineering under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS, at the Commercial Museum, Philadelphia, Pa. For further information write to: Manager, E. K. Stevens, 480 Lexington Ave., New York 17, N. Y.

MARCH 28-APRIL 1, 1955—Ninth Western Metal Exposition and Congress sponsored by the AMERICAN SOCIETY FOR METALS and nineteen other technical societies to be held at the Pan-Pacific Auditorium and the Ambassador Hotel, respectively, Los Angeles, Calif. A.S.M. secretary, William H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

APRIL 13-15, 1955—Tenth annual Meeting and Lubrication Exhibit of the AMERICAN SOCIETY OF LUBRICATION ENGINEERS at the Hotel Sherman, Chicago, Ill. Administrative secretary, William P. Youngclaus, Jr., 84 E. Randolph St., Chicago 1, Ill.

MAY 16-20, 1955—SIXTH NATIONAL MATERIALS HANDLING EXPOSITION at International Amphitheatre, Chicago, Ill. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.



"The savings effected with this 6" DELTA Grinder amount to over \$2,000.00 over a nine-year period, reports Mr. Grey, shop foreman at Precision Gear and Machine Company.

Both bench and floor models of the DELTA Carbide Tool Grinder operate without vibration because they have dynamically balanced aluminum wheel mount ings that are machined after assembly. Tilting table $(30^{\circ}$ toward and 45° away from the wheel) is supported by wide-spread, double trunions.



Precision Gear and Machine Company, Charlotte, N. C., placed a Rockwell-built DELTA Carbide Tool Grinder in their plant nine years ago. Employed to grind carbide cutting tools for eighteen lathes in the machine shop, the DELTA Grinder is equipped with one 6", 120 grit silicon carbide wheel, and 6" diamond wheel

Comments Boyce Grey, shop foreman: "In the nine years since we bought it, our DELTA 6" Grinder has saved us over \$2,000.00. The ruggedness and accuracy of the DELTA lets us do the

same quality work with 6" diamond wheels that we used to do with far more expensive 10" wheels. This means that the saving in diamond wheels alone has been over twenty times the original cost of the grinder. I guess you could say it's worth its weight in diamonds."

DELTA Carbide Tool Grinders and other rugged, low-cost DELTA Power Tools will perform 90 % of the jobs in your shop to the same accuracy standards as special machines costing many times as much.

That's why - throughout industry there is a growing trend toward accurate, portable, low-cost DELTA Power Tools, You can use them to cut costs, too. Talk to your DELTA Dealer; he's listed in the classified section of your phone book under "TOOLS" or "MACHINERY." Send the coupon for complete data.

with 1/4 " side face.

DELTA QUALITY POWER TOOLS

For more information on products advertised, use inquiry Card, page 265

Rockwell



DELTA QUALITY MAKES THE DIFFERENCE

Rockwell Manufacturing Co. 614 L North Lexington Avenue, Pittsburgh 8, Pa. ☐ Please send Delta AB-53 catalog. ☐ Please send name of my nearest Delta Dealer. City......State.....State....

Delta Power Tool Div.,

MACHINERY, November, 1954—285

Highlights of the Machine Tool Distributors' Meeting

ACHINE tool replacement was the theme of the thirtieth annual meeting of the American Machine Tool Distributors' Association, which was held at the Sheraton-Gibson Hotel, Cincinnati, Ohio, on October 19 and 20. This theme was aptly summed up in an address by Dr. William W. Gilbert, consultant on machinability, General Electric Co., Schenectady, N. Y., in which he said, "You can't do today's work with yesterday's tools, and expect to be in business tomorrow.

In the opening of the general session, the president of the Association, Thomas R. Rudel, Rudel Machinery Co., Inc., New York City, briefly outlined the growth, activity, and progress of the Association. This was followed by reports from the Government Relations Committee and the Sub-Committee on Permanent Defense Capacity, as well as other committees

In an address entitled "New Techniques for a New Market," H. L. Tigges, president of the National Machine Tool Builders' Association, Cleveland, Ohio, and executive vice-president of Baker Brothers, Inc., Toledo, Ohio, stated, "Our major market, in my opinion, is the replacement market here in the United States, where obsolescence has been allowed to accumulate at an alarming rate. Our job, you might say, is to keep America modern. And as of today it is, believe me, our job. Government isn't going to do it. Government steps into that sort of picture only under the pressure of national defense. Our customers aren't going to do it unless they are sold on the replacement idea. The metal-working plants of America must be kept modern, both to maintain and advance our standard of living, and to keep this country prepared for an emergency involving defense."

Ralph E. Cross, Assistant Administrator, Business and Defense Services Administration, Department of Commerce, Washington, D. C., said in his speech, "An expanding economy via free enterprise is one of the primary concerns of the Administration in Washington. President Eisen-



Fabian Bachrach

R. A. Vidinghoff, the newly elected president of the American Machine Tool Distributors' Association

hower believes in the sound judgment and the unlimited resource-fulness of America under the free enterprise system. He believes that people can do more for themselves, if allowed to do so, than any government can do for them. The trend is away from big government, away from bureaucratic control, and toward greater freedom. In a broad sense, this is the most significant development in Washington."

Mr. Cross continued, "The Business and Defense Service Administration was established to bring business and Government closer together. It serves business and it serves Government in a defense capacity. Among its activities BDSA has been working closely with the Bureau of the Census to get data which is useful and meaningful to Government and business alike. It has been extremely active in the field of international trade and has been doing its utmost, on the one hand, to eliminate trade restriction where it is in the interest of the United States and, on the other hand, to provide greater protection for American business where it is required. Another service is BDSA's industrial defense program which is designed to educate business management on the danger of war and bomb damage. Another most

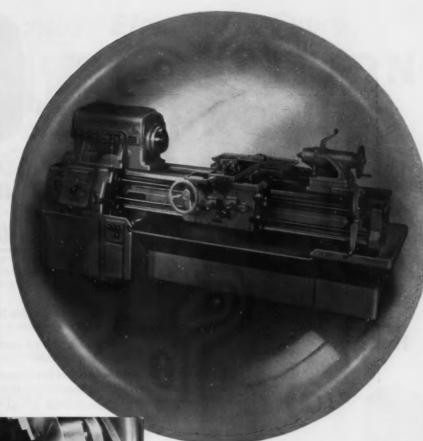
important function of BDSA is advising ODM on the management of Government-owned production facilities, including machine tools. It is estimated that the replacement value of all Governmentowned machine tools is probably in excess of \$6,000,000,000.

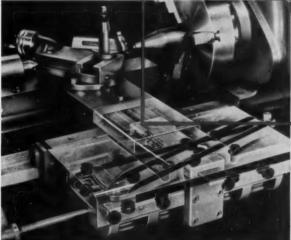
"The use of this investment can have a tremendous impact on the economic well-being of our country. Before these Governmentowned tools will be used to serve the interest of all the people, many issues will have to be debated and resolved by people who understand the problems. The Metal-Working Equipment Division of BDSA has taken the initiative by bringing the problem out into the open. It has made a proposal to the President's Board of Economic Advisors for a high-level review of the entire subject. The proposal also requests the formation of definite policies for the management and use of Government production facilities and, in addition, specific long-range policies for capital replacement and modernization to eliminate the enormous peaks and valleys in the metal-working equipment industry."

The following officers were elected for the coming year: President, R. A. Vidinghoff, Machinery Associates, Wynnewood, Pa.; vice-president, Henry R. Hanson, Wm. K. Stamets Co., Cleveland, Ohio; second vice-president, Joseph F. Owens, Jr., J. F. Owens Machine Co., Syracuse, N. Y.; and secretary-treasurer, Frank Habicht, Marshall & Huschart Machinery Co., Chicago, Ill.

Members of the executive committee who were elected for the terms expiring in 1957 were J. O. Ellison, Harron, Rickard & Mc-Cone Co. of Northern California, San Francisco, Calif.; J. M. Rudel, Rudel Machinery Co., Ltd., Montreal, Quebec, Canada; and G. E. Merryweather, Motch & Merryweather Machinery Co., Cleveland, Ohio. Phil Hoffman, Hoffman-Marquard Machinery Co., Inc., St. Louis, Mo., was selected for the term expiring in 1956 to fill the unexpired term of Frank Habicht, who was elected secretary-treasurer. J. Russell Clark, White Star Machinery & Supply Co., Wichita, Kans., replaces Art C. Evered.

BALL
BEARINGS
make
a product
BETTER





Twenty New Departure ball bearings are used in the Monarch Machine Tool Company's antifriction bearing taper attachment. There are 12 single-row bearings, 8 double-row bearings. All are permanently lubricated.

Many advantages of the Monarch lathe taper attachment are—according to its maker—the result of New Departure ball bearings. For by their use, backlash, friction and lost motion are almost entirely eliminated . . . smoother, more accurate tapers are possible. And Monarch's taper attachment takes heavy cuts even when boring or turning acute angles, for ball bearings give rigid support under both radial and thrust loads.

Call your New Departure sales engineer. Have him show you how New Departure ball bearings make a good product even better!

NEW DEPARTURE

BALL BEARINGS

NEW DEPARTURE + DIVISION OF GENERAL MOTORS - BRISTOL, CONNECTICUT

Plants sho in Mexicene Connecticut and Sandursky, Office

Close Tolerance

High Strength



N HAVE ALL SIX ... PLUS Uniform Machinability



Fine Surface



Toughness



Hardenability

Maybe you want some of these properties in your steel parts. Or a combination of them. Or only one.

No matter which ones you need, you get them-plus uniform machinability-in Republic Cold Drawn Steels.

That's why so many manufacturers have come to Republic with their machining problems. Manufacturers whose costs and production records show their automatics aren't turning out what they could.

Republic's 3-D Metallurgical Service focuses the combined experience of the Field, Mill and Laboratory on your particular problem. And the recommendation you get is based on your plant, your product, and your equipment.

There's no reason to deny yourself this service. It costs only the price of a phone call to your nearest Republic office. And it can save you a lot. Do it today.

REPUBLIC STEEL CORPORATION

Union Drawn Steel Division . Massillon, Ohio GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York CLEVELAND 1, OHIO



Accuracy of Section

REPUBLIC COLD PRAWN ALLOY STEEL BA

Other Republic Products include Carbon and Stainless Steels - Sheets, Strip, Bars, Wire, Pig Iron, Steel and Plastic Pipe, Bolts and Nuts, Tubing

One Priceless Element In Every

POPE PRECISION SPINDLE

THE Confidence OF ITS USER

You can have complete confidence in the antifriction bearings POPE puts into your spindles.

They are made to new super-precision tolerances.

You can depend upon Pope Spindles for the continuous production of accurate parts, fast removal of the surplus metal and fine low micro-inch surface finishes.

POPE Spindles have radial and axial rigidity capable of properly supporting modern cutting tools on high production work.

The shafts are large for extra rigidity and have enormous excess capacity.

With the POPE SYSTEM of Grease Lubrication used successfully for thirty-four years, there is no internal radial clearance for oil film in the bearings — none is required. Instead, the bearings are permanently internally preloaded for accurate centering and positioning of the shaft.

POPE leadership in spindle design and constant PROGRESS in engineering and manufacturing reduce your tolerances and production costs.



Specify POPE

POPE MACHINERY CORPORATION

stablished 1920

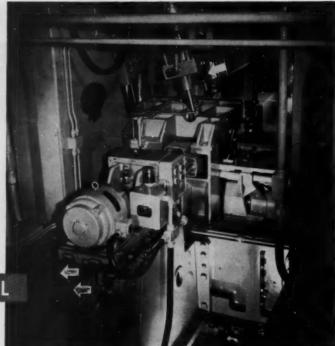
261 RIVER STREET . HAVERHILL, MASSACHUSETTS

No. 103

50
Auto Blocks
An Hour!

WITH THE HELP OF LUDLUM

SARATOGA TOOL STEEL



Ludlum Saratoga was used for the steel ways (note arrows, above) of this giant unit, illustrated at left in a bird's-eye view reduced to miniature size.

Write for BLUE SHEET ON SARATOGA



This concise four-page folder gives all needed handling and shop treatment details on Saratoga. Included is certified laboratory information on physical characteristics, and complete data on forging, annealing, hardening, tempering, etc. Ask for your copy.

Address Dept. M-59

98 SEPARATE OPERATIONS are carried on by this versatile machine which turns out 50 V8 auto engine blocks an hour. It consists of 18 machining units, each of which is fitted with hardened and ground steel ways of Ludlum Saratoga to guarantee accuracy in production.

MILLING, TREPANNING, DRILLING, counterboring, reaming, chamfering, automatic inspection of holes for depth and removal of chips are the operations performed by this amazing mechanism.

LUDLUM SARATOGA WAS USED BECAUSE its extreme hardness, high resistance to wear, and excellent machinability more than met the customer's high requirements for maintaining accuracy in this huge, multi-station machine.

ALLEGHENY LUDLUM METALLURGICAL SERVICE can solve your tool or die steel problems. • Call your local A-L representative or distributor today, or write Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pennsylvania.

For complete MODERN Tooling, call Allegheny Ludlum



THE ULTIMATE

IN

BEVEL GEAR ACCURACY



- · low-cost tooling
- · simplicity of set-up

120 MIKRON

*fine pitch*BEVEL GEAR

HOBBING MACHINE

BUSSELL, BOLBROOK & BENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

"So popular with our shop men it's overworked to the neglect of our several other punch and shear machines. In fact, so much that I have ordered another."

Writes L. A. Delisle, Shop Superintendent Bushnell Steel Works, Inc., Tampa, Florida

about his "BUFFALO" UNIVERSAL IRON WORKER



ONE MACHINE DOES UP TO 5 FABRICATION JOBS

What Mr. Delisle's men like about the U. I. W. is that you can do a whole shop-full of fabrication jobs on a work piece without travelling from machine to machine. You can do a wide variety of punching—such as the Bushnell man above is doing on the I-beam web and flange—while another man can be mitering angles or tees 90° or

45°, cutting round or square bars, cutting flats, slitting or notching at the same time. Small wonder so many users of "Buffalo" Universal Iron Workers call them the "Most useful machines in the shop". Why not write for Bulletin 360-E and look into these durable, multi-purpose machines that will save space, dollars and hours in your shop?



BUFFALO FORGE COMPANY

440 BROADWAY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING

PUNCHING

SHEARING

BENDING

At Kaydon engineering corporation:

Maintenance Costs on

KING

VERTICAL BORING & TURNING MACHINES

Less than \$25 a year

PER MACHINE!



A 65¼" dia. Bearing Ring is shown being machined on a 72" KING Vertical Boring & Turning Machine at The Kaydon Engineering Corp. Accurate machining of these large diameter, thin sections is essential, since machining distortion cannot be removed by

The Kaydon Engineering Corporation, Muskegon, Michigan, manufactures a complete line of high precision ball and roller bearing assemblies, with rings of 4" bore to 120" OD. An essential part of Kaydon's distortion control methods for manufacturing these large diameter bearing rings having thin sections—often under ½" at the raceway—is accurate machining of the ring OD, face, and groove on KING® Vertical Boring & Turning Machines. (See photo above.)

Mr. Maurice Jensen, General Superintendent of the Kaydon Engineering Corporation, makes the following statement concerning his experience with KING machines: "Three 72" Kings have been in operation for about two years, 24 hours a day, five days or more per week, and our total maintenance cost for the three

machines has been less than \$25 a year per machine. One 72" King has been in operation for ten years with less than \$50 yearly maintenance cost over this period."

heat-treating.

Mr. Jensen further states, "It is possible to consistently produce pieces from these machines with a maximum eccentricity of .001. For high production runs and machining approximately .100 for a finish cut, we have successfully maintained a .005 tolerance, and we have found that the dial readings will repeat and give us a maximum variation of .003 to .005."

Here again is on-the-job evidence of typical KING performance... and why KING is industry's first choice for accurate, economical work. KING machines are made in 10 sizes, 30" to 144", in a variety of head combinations. Look into their advantages for your production.

American Steel Foundries

KING MACHINE TOOL DIVISION

1150 TENNESSEE AVENUE

CINCINNATI 29, OHIO



on cardboard tubes. The customer states this saves time in assembling.

A filter was re-designed to use fused edges, so that it could be delivered to the customer's plant ready for assembly without any processing whatever.

American was supplying felt strip in rolls. After examining the application, it was suggested that the felt be supplied in cartons, each containing 5,000 feet, the end brought out to the top of the carton, so one strip could be quickly joined to the end of the preceding one. Result: much time saved in replacing rolls.

How Much Does it Cost Not to Know?

By FRANKLIN D. JONES*

In these progressive times it is essential for executives in manufacturing plants to keep posted on any developments which will result in either a better product or a more efficient manufacturing method. But developments and improvements are so numerous that finding time to keep up with the procession often presents a complicated problem.

The classes of mechanical developments here referred to relate, in general, to machine tools and their auxiliary equipment, to materials used in making mechanical products, and to the various manufacturing processes utilized in producing all types of machines and devices. This covers considerable mechanical territory as it includes an almost endless variety of products and problems. Since such is the case, the kind of information which designing and manufacturing executives can utilize to advantage is bound to vary more or less in different plants.

In order to indicate clearly the kind of information believed to be important, we shall refer briefly to a variety of items or subjects typical of the machine-building field. All of the information to be presented was obtained from one readily accessible source that is made to order for the busy executive.

°For many years Associate Editor of Machinery and Editor of Machinery's Handbook. Author of numerous technical books directed to the metal-working industries

Do You Encounter Problems Like These?

One decision production men must frequently face is whether it would pay to buy a special machine tool that is designed around a given part. Obviously, such machines are warranted only when large numbers of parts are required at a high rate of production. Numerous examples might be cited to show the possibilities of single-purpose machines. We shall take as a typical example the connecting-rod for an automobile engine. The machine in this particular case drills, reams, and chamfers the bolt holes: drills, reams, and chamfers the piston-pin hole; and mills the lock slot. There are six stations: one for loading, two for drilling, one for chamfering, one for milling, and one for reaming. The production rate is 450 connecting-rods per hour.

In some cases, parts that obviously should be machined by broaching are so small that it may be preferable to avoid using a regular broaching machine which has been designed for heavy work. An economical procedure in such a case would be to use a self-contained broaching fixture of the portable bench type. A commercial fixture of this type is applicable to small jobs requiring a pull not exceeding 2000 pounds and a stroke of 25 inches or less. Such a fixture is effective and economical for such work as broaching oil-grooves, small splines, serrations, keyways, and slots; burring; and sizing holes.

Where high rates of production are essential in forming splines or serrations on large quantities of duplicate parts, rolling or "chipless" machining is highly efficient. Splines or other tooth shapes can be formed in a few seconds as the workpiece is rolled between two forming racks. The splines thus formed may be either straight (parallel with the axis) or helical. The stroke of these machines is variable, depending upon the size of the forming rack required for the part being produced.

When production is not high enough to warrant use of special automatic equipment, standard machines may in some cases be converted by means of auxiliary appliances for automatic operation. A practical example is represented by a conventional punch press equipped with two automatic stock reels (one for unwinding the stock and one for rewinding it), a stock oiler and wiper, a plain stock straightener, and a slide-feed. Auxiliary units are available that can easily be adapted to handle material of varying width, thickness, and length of feed.

The importance of centralized control in the operation of machine tools has long been recognized, and this control principle has been applied to many different types. An interesting example is a lathe equipped with electronic selection and control right at the carriage. This control applies to all feeds and also to all of the 20 to 1 range of motor speeds. Both feeds and speeds are infinitely variable and can be changed in fine increments while the tools are cutting.

For machine parts requiring a wearresistant surface and a tough ductile interior it may be profitable in certain cases to compare the production obtainable by automatic flame-hardening with other methods such as nitriding and carburizing. In one case, a leading manufacturer of trucks and marine equipment, using an automatic oxy-acetylene flame-hardening machine, increased production of flamehardened gears, bearings, and camshafts 300 per cent. The parts are flame-hardened on as many as twenty-two different surfaces in fast, simple operations. Distortion is minimized and the casehardened depth easily and accurately controlled.

Selecting the right manufacturing equipment from the numerous types on the market frequently is a big problem for production executives. Suppose, by way of illustration, that you have a press job requiring a series of operations, beginning with a flat circular blank 5 inches in diameter and 0.090 inch thick. There are six successive drawing operations, a flangeforming operation, a sizing operation (to a tolerance of 0.0005 inch on the inside diameter), a restriking operation on the flange, piercing ten small holes, lancing four locating tabs, and trimming the part to the final diameter. For a high production up to twenty-eight pieces per minute, a transfer-feed press is the answer. All possible trouble spots have been anticipated in these modern machines and guarded against by electrical control circuits. Tiny switches "police" trouble areas and take corrective measures when needed.

Grinding the ends of small spindles, such as are used on a cotton picker, might be thought of as a simple operation but it is not so when the desired rate of production is about 1500 parts per hour, or one spindle every 2.4 seconds. This job at the rate of production mentioned was done readily on a semi-automatic single-spindle disc grinder equipped with a rotary work-carrier and gravity type magazine feed. The maximum stock removal was 5/16 inch and the tolerance 0.004 inch.

The drawing of complicated irregular forms often is both difficult and costly by conventional methods. Such work has been greatly simplified and tool cost minimized by the Hyrdoforming process. As one example, a blank of aluminium 23 inches in diameter and 0.051 inch thick was formed to a combined hemispherical and irregular

shape in one operation. A plastic punch and a simple draw-ring were used. For a similar job, formed from a 19-inch aluminum blank 0.032 inch thick, a punch of cast aluminum was employed.

When cold-drawn steel bars are used for machine parts, carburizing may be done to obtain the required surface hardness, although the heat-treating operation can be avoided by using what are known as "carbon-corrected" bars. Carbon correction is the restoration of carbon lost from the bar surface during hot-rolling. This lost carbon is restored through annealing in a controlled carbon-rich atmosphere prior to cold-drawing; hence it is not necessary to machine or grind away the surface to remove "decarb." Furthermore, it is unnecessary to buy over-sized bars to allow for surface removal, and better machinability is obtained.

In the use of copper, the properties that will serve to the best advantage are, of course, very important. As a simple illustration, copper gaskets were needed for fuel-injection pumps used on large Diesel engines requiring high pressure to inject fuel near the top of the compression stroke. The gaskets were made by cutting rings off copper tubes instead of stamping them from strip stock. This practically eliminated scrap and, since the tubing is made of deoxidized copper, it is superior in this application to electrolytic copper.

In using carbide tools for tough steelcutting jobs, it is important to use a different grade for medium-duty steel cutting than for heavy-duty work. The right grade combines high wear resistance with extreme toughness; it will operate at temperatures as high as 1800 degrees F. without tip deformation and machine normalized steel at about 300 surface feet per minute.

In die-casting aluminum, the high temperatures necessary made it difficult to lubricate the machine parts in the area of the heated dies. Various complicated lubricating mixtures were tried but they thinned out and did not cling well to the hot surfaces. Oxidation of the lubricants also produced deposits that caused sticking of machine parts, (particularly ejector pins), staining of aluminum castings, and excessive "down" time for cleaning. An oil developed for high-temperature lubrication solved the problem. It does not run from hot surfaces and its unusual depolymerizing characteristic has prevented the formation of troublesome deposits.

In this instance, as in many others, the application of a remedy may be postponed, or *never* tried unless whoever is responsible for utilizing modern developments keeps in touch with them. This leads to the final point.

How Can Busy Executives Keep Posted on Improvements and New Developments?

After reading this review of case histories, perhaps you are wondering where information of this general character can be obtained with a minimum expenditure of time and effort. You may be surprised to learn that all of this instructive material was taken directly from the advertising pages in a single issue of Machinerythe October number, which is typicaland represents only a small part of the usable information available. Your attention has been focused on the informative value of modern advertising because we do not know of any other source where so much thoroughly practical information on developments in machine tools, cutters, parts, materials, and processes, can be secured with such a small expenditure of time and effort.

How much will it cost *not* to know about these developments? The advertising section in every issue of Machinery is actually an exhibition of the very latest in machine-building equipment and processes. Consistent reading of the "ads" will safeguard against overlooking some new or improved machine, material, or method which may be of very great importance in

your plant. By actual count, there were 276 different types and makes of machine tools, unit parts, and materials described in the advertising pages of this single

issue. The table shows a general classification of the various items. Full information concerning any case histories can be obtained from MACHINERY.

	Number e Reference
Automatics—single- and multiple-spindle	3
Auxiliary unit parts-coolant pumps, clutches, motors, gears, cams, con-	
trollers, bearings, air and hydraulic cylinders, forgings, castings	40
Boring, drilling, turning, and milling machines—vertical and horizontal	3
	2
Broaching machines—horizontal, vertical, and continuous surface types	6
	10
Cutting fluids, lubricants	7
Cutting-off machines—saw and abrasive types	
Orilling machines—single- and multiple-spindle; radial	7
orging equipment	2
Sages-air type, dial, optical or contour projector, micrometer, snap,	11.24
and gear measuring	9
Gear-cutting machines	2
Frinding machines—cam, thread, tool and cutter, portable, vertical, uni-	
versal, thread, and form	8
Frinding machines—cylindrical, internal, and surface types	13
rinding wheels	5
loning and lapping machines	5
athes-engine, turret, automatic, chucking, precision, and tracer or du-	
plicating types	18
fachine tools of single- or special-purpose type	12
fachine tool attachments-mechanical, pneumatic and magnetic chucks;	
drilling and tapping; tracer; bar feed	10
faterials-steels, sheet, bar, and tubing	18
filling machines-horizontal, vertical, thread, and profile types	6
fiscellaneous equipment—chamfering and deburring machines; edge	
trimmer for strip stock; metal-cleaning machinery; slitting ma-	
chines; spline-rolling machine; hardness testing apparatus; key-	
seating machine; metal-cutting band saw; equipment to prevent	
distortion in heat-treating; riveting machine; and equipment for	
welding, blast cleaning, and flame hardening	15
	10
liscellaneous parts—self-tapping screws, oil seals, retaining rings,	
dowel-pins, laminated shims, and gaskets	0
aning machines—planer or shaper types	2
resses-crank type, double- and triple-action, transfer, turret, extrusion,	-
hydraulic, and brake	23
mall tools-for turning, planing, boring, drilling, broaching, reaming,	
milling, knurling, thread rolling, tapping, and press work	33
apping equipment-machines, torque type holders, chucks, and at-	
tachments	8
hreading machines-automatic and roll	3





production

Specifications

Total table stroke .								6"
Top of table to top o	f br	idge						4"
Width of bridge .								3/8"
Multiple boring head			uir	ed	by t	ooli	ng	to a
maximum of (4) 209	hea	ds						
Table dimensions .					1	71/2		
Floor space (without	coo	lant	tan	k)		31'	X	54"



The Bryant 998 Boring Machine is a production machine for precision boring, drilling, turning, facing, grooving and contour turning and boring where fine finish and rapid production are desired.

Constant repetitive accuracy is designed into the Bryant 998. The table is mechanically actuated by a simple cam and lever unit. The cycle is positive . . . free from variation due to temperature change.

The table moves on two 4" dia. hardened and ground solid steel bars firmly bolted to the bed. Each slide bar has two widely separated bearings—hardened steel sleeves surrounding retainers in which 150 balls of 3% diameter are mounted under preload.

This rugged slide construction provides metal-to-metal contact, resists loads from any direction, provides sensitive response and uniform travel.

The Bryant 998 will withstand heavy use and will continue to produce parts within tolerance at the specified production rate.

■ BRYANT

Chucking Grinder Co.

SPRINGFIELD, VERMONT, U. S. A.

Internal Grinders - Region Machines

Internal Grinders • Boring Machines
Internal & External Thread Gages • Granite Surface Plates

For more information on products advertised, use Inquiry Card, page 265

Mail coupon for complete details!

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VT.

Gentlemen: Please send me your Bulletin 998. M

Name...

Title...

Company...

Street...

City...

Zone...

State.....

MACHINERY, November, 1954-295



COMBINED

CIRST TO TURN CAST

STEEL CRANKSHAFTS!

Was the First to Turn Nodular Cast Iron Crankshafts!

Wesson Is First to Turn Cast Steel Crankshafts!

THE MEN

Schematic illustrates front and rear slides. Note special mul-tiple tool adaptations possible only with Band-Type Multicuts!

· More Productive Tools TO CREATE ...

FOR THE BENEFIT OF ALL WORKING TOGETHER

- More Productive Machine Tools
 - . More Uniform Quality Carbide
 - . Lower Costs

THE MACHINE

THE METAL





single and multiple tool set-ups. Exclusive features include "built-in flush gage" for quick, accurate intent set-up" in the machine, low cost steel band is replaceable, insert removal diop permits fast and easy insert removal. The body is practically indestructible! Available in over 100 standard sizes—



Credit lines above are typical of Wesson's thorough app to "tough" tooling problems." Working together wi metallurgist, the Tool Engineer. Working toget customer, Wesson Field Engineer, Machine Tool Built

WESSON COMPANY
1220 WOODWARD HEIGHTS BLVD., FERNDALE 20, MICHIGAN



WESSON METAL CORPORATION

New Catalog

An accurate, simplified way to apply the RBEC*formula when selecting cylindrical **Roller Bearings**

ROLLWRY CATALOG TR-854-DC

Hot off the press is Rollway's Tru-Rol Catalog presenting...

New Rollway Alignment Chart

Now, for the first time, RBEC* formula is converted into simple nomogram! Complicated selection procedure eliminated! Using this graphic method, simply draw two lines—and find in a matter of seconds the proper bearing for your application.

Complete Description, Ratings, Dimensions

All the data you require on every size and type of Tru-Rol Roller Bearings. And here is introduced the new, exclusive quality mark in the Tru-Rol field— Crowned Rollers! Crowning eliminates end loading, produces uniform stress pattern along full length of roller, and extends bearing life.

SEND FOR YOUR FREE COPY



Included with Rollway's new 36-page catalog are extra copies of the new Alignment Chart. Mail coupon for yours today!

ru-Rol

Easy Quick Solution Graphically

All Tru-Rol Bearings Now Have Crowned Rollers

Crowned Roller under full load stress uniformly distributed.

*Roller Bearing Engineers' Comm.—Anti-Friction Bearing Mfrs. Assn.

ROLLWAY

COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARINGS

ROLLWAY BEARING CO., INC. Syracuse 4, N.Y.

Please send free copy of your new Tru-Rol Catalog with extra Alianment Charts.

Name..

Firm Name.. Address

SALES OFFICES: Syracuse * Beston * Chicago * Detroit * Torento * Pittsburgh * Cleveland * Milw





Holes on extremely close centers vary in diameter from ½6" to 13/6". The valve body has 33; the cover, 18.



"-BUT OUR PRODUCTION RUN IS LIMITED."

"SO WAS THE RUN ON THIS AUTOMATIC TRANSMISSION PART, BUT"...



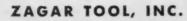
HERE'S HOW ZAGAR TOOLING SAVED MONEY HAND OVER FIST

This aluminum die casting is processed in its entirety by Zagar planning, except for milling two faces. Two lines of Zagar standardized self-clamping drill jigs ream, tap and drill both valve body and cover. With 24 heads and 24 fixtures, Zagar performs work on 51 holes on

close centers. Step tools take care of reaming and burnishing. The fixtures were designed to compensate for slight inaccuracies in the die casting. Thus has Zagar engineering solved an acute problem of limited production without the purchase of costly special machines.



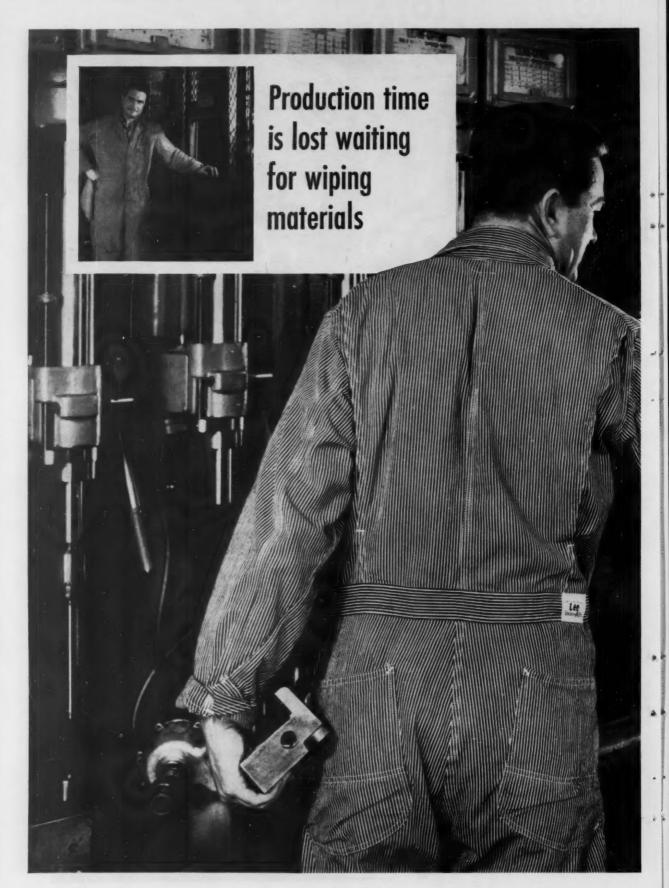
Ask on your letterhead for Bulletin "M-11."

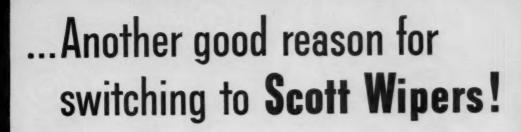


24000 LAKELAND BOULEVARD . CLEVELAND 23, OHIO



TOOLS FOR INDUSTRY





Instead of having to leave the job to get clean wiping material, workers keep a box of Scott Wipers next to them all day long. This simplified system of distribution and control saves valuable production hours.

Scott Wipers are sanitary, disposable. They end the laundering problem . . . greatly reduce the

costly scratches and digs in finished work caused by chips lodged in wiping materials.

They are soft and absorbent, yet each Scott Wiper is two-ply and tough.

Whatever you're using now—compare them with Scott Wipers for cost, convenience, performance.

The Scott representative or distributor in your area will be glad to help you set up a production-line demonstration in your plant. Call him or mail the coupon today.

Scott Paper Company, Dept. M-2, Chester, Pa. Please send me full information on Scott Industrial Wipers.

me_____Position_

Company

Address City State



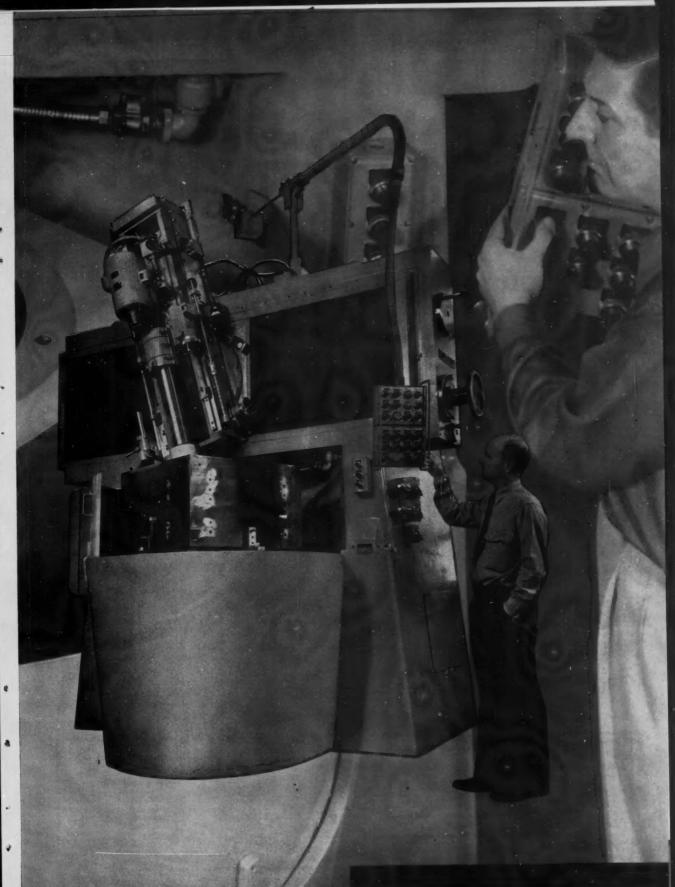


... plus up to 8" more for the occasional out-size job ... plus 27½" grinding head stroke, 24%" clearance over face plate, 42" diameter face plate — on Springfield's new Vertical Universal Grinder.

The work piece on the grinder here is a washing machine agitator mold, 43" corner to corner. A tapered hole through it must match a conical male part (small illustration). One angle setting of the head ground both male and female taper for perfect fit. It had been planned to hand-lap them, a week's task. Springfield's time: 4½ hours.

Other Springfield Vertical Universal Grinders—swings 21" and 30". Lathes—toolroom, engine, contouring, reproducing—14" to 32". Write for name of nearest Springfield dealer.

BITH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS



THE SPRINGFIELD MACHINE TOOL CO. SPRINGFIELD, ONID

SPRINGFIELD

Your Choice

3 TYPES OF SPINDLES

ON SOUTH BEND LATHES





Extra Charges for Type L and Type D1 Spindle Noses

Size of Lathe 10"-1" C & Ser. 1000 13"-1" Collet 14½"-1" Collet 16", 16-24" & 2-H

Long Taper Type L-Size 00 \$25.00

Type D1-Size 4" \$33.00 38.00

CAM LOCK SPINDLE Greater interchangeability of chucks, collets and fixtures are yours with South Bend Lathes. All 10"-1" Collet and larger lathes can be supplied with 4" Type D1 Cam Lock Spindles, Size 00 Type L Long Taper Key Drive Spindles or the regular threaded spindles as shown. Keep this in mind when buying lathes so you can better take advantage of

New Catalog

more information.

Describes all South Bend Lathes, Turret Lathes, Shapers, Drill Presses,

Grinders. Complete specifications and descriptions. Write for Catalog

the extra values you get in

South Bend. Send coupon for

Compared with our costs OUR PRICES ARE LOWER than they were back in 1941







Cam Lock







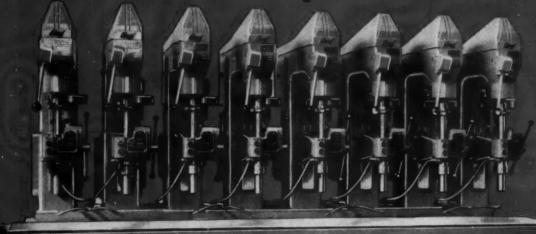
Building Better Tools Since 1906 . SOUTH BEND LATHE . South Bend 22, Indiana



more parts...
more operations...
PER HOUR

avey

SUPER EIGHT SPINDLE No. 2 BMA-6 DRILLING MACHINE





for drilling...tapping...production machines



Featuring power lift to table by push button control

- Hand Feed
- Power Feed
- Lead Screw Tapping
- Four Feeds
- Six Speeds
- · Built-in Coolant System

THE AVEY DRILLING MACHINE CO., Cincinnati 1, Ohio

What's The Best Way **To Gage These Parts?**

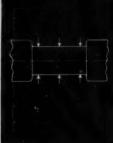
Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage



Three OD's Tolerance: .0009"

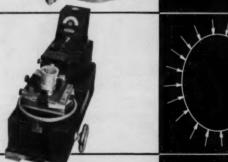
One three dial T-P CompAIRator and Air Snap Gage checks three points simultaneously on the journals of an automotive crankshaft. Functions of the diameter (taper, barrel shape, etc.) may be seen at a glance. Simple, accurate, fast - savings in inspection time alone paid for this unit in short order.

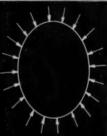




Ovality Tolerance: .007" on radius

One single dial CompAIRator Air Gage checks the contour of the skirt section on this piston. Indexing table is graduated in 5° increments, permits checking entire contour at one setup. Extremely sensitive yet sturdy, vibration, jarring, tilting won't disturb the accuracy of a T-P CompAIRator.





Taper and Diameter Tolerance: .002

A two dial T-P CompAIRator slashes former inspection costs. One indicator checks diameter. The other, a new T-P Computing Comp-AIRator, measures and figures the taper. Indicates it directly on the dial face. Eliminates usual 2 measurements and a computation. Computing CompAIRators may also be used to check center distance, concentricity of di-

ameters, and squareness of bore to face.

WHAT IS A COMPAIRATOR AIR GAGE?



For more examples and the complete story on Taft-Peirce CompAlRator

Air Gages send for Bulletin.

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.











COMPUTING

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

660 OPERATIONS PER HOUR AT...



33 Tractor Pedestals Drilled and Chamfered with BAUSH 3-Way Horizontal Unit!

The 3-Way Harizontal Unit illustrated - designed and built by Baush to do this specific job, consists of:

3 Mechanical Leadscrew Units 1 — 10 Spindle Fixed Center Head

1 - 6 Spindle Fixed-Center Head

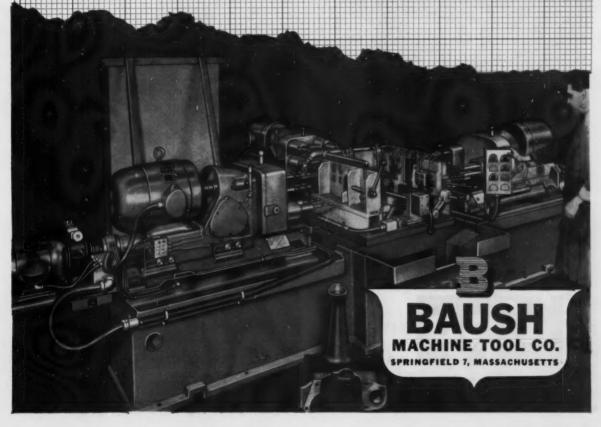
1 - 4 Spindle Fixed-Center Head

J.H.C. Controls and Automatic Lubrication. Holding Fixture.

Pedestal for Tractor Part:

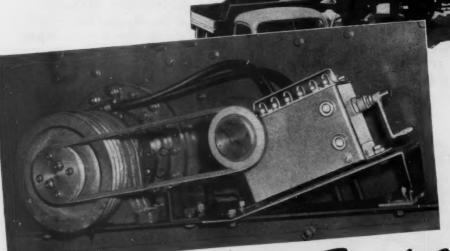
10 Drilling - 10 Chamfering Operations: 33 Pedestals per hour at 80% Production: efficiency — A total of 660 operations per hour.

Let Baush design and build equipment to meet your specific machining problems for faster, economical, quality production. Send us your problems — there is no obligation.



machines of
great performance
use the most dependable
oiling system
ever developed

A Model 50 Madison-Kipp Lubricator installed as original equipment on a Model 848 Barber-Greene Asphalt Mixing Plant manufactured by Barber-Greene Co., Aurora, Illinois.



MADISON-KIPP Fresh Oil

dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors.

You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.

There are 6 models to meet almost every installation requirement.



MADISON-KIPP CORPORATION

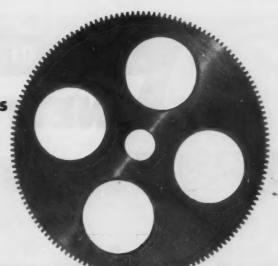
203 WAUBESA STREET . MADISON 10, WIS., U.S.A.

Skilled in Die Casting Mechanics
 Experienced in Lubrication Engineering
 Originators of Really High Speed Air Tools

308-MACHINERY, November, 1954

For more information on products advertised, use Inquiry Card, page 265

Here's Why
you can check precision gears
more conclusively
with Kodak Conju-Gage
Gear Checkers





Why the composite check

Errors in gears seldom occur individually—they're usually combinations of as many as six types of errors. The practical way to test gears for these errors is to test them in action through the composite check recommended in the new American Standard (AGMA 236.02; ASA B6.11-1951).

This check measures gear errors as variations in center distance when the gear is rotated in contact with a master of known accuracy. Since this variation is the sum of errors in both gear and master, the degree of precision measurable depends on the precision of the master.



The Kodak Conju-Gage Gear Checker automatically records the composite effects of runout, base pitch error, tooth thickness variations, profile error, lead error, and lateral runout. Illustrated is the Kodak Conju-Gage Gear Checker, Model 4U, for gears up to 4½" pitch diameter. Larger and smaller models are also available.

Why the Conju-Gage Gear Checker

Kodak Conju-Gage Gear Checkers use a master of exceptional accuracy, the Kodak Conju-Gage Worm Section. These Worm Sections are generated by the continuous action of a thread grinder under control of a precision lead screw—circular pitch error and tooth thickness variations cannot be introduced by defects in an intermittent indexing mechanism. This means a more accurate gaging element, less chance that error in the master may coincide with a tolerable error in the gear to result in a needless rejection. Less chance, too, that an error in the master may subtract from an intolerable error in the gear, passing a gear that will fail in use.

By passing each right gear, rejecting each wrong gear, the Kodak Conju-Gage Gear Checker helps you reduce costs while maintaining highest precision. For the full story of this and other economies achieved by Conju-Gage instrumentation, send for the booklet, "Kodak Conju-Gage Gear Testing Principle." Write to:

Special Products Sales Division
EASTMAN KODAK COMPANY, Rochester 4, N.Y.

CONJU-GAGE



INSTRUMENTATION

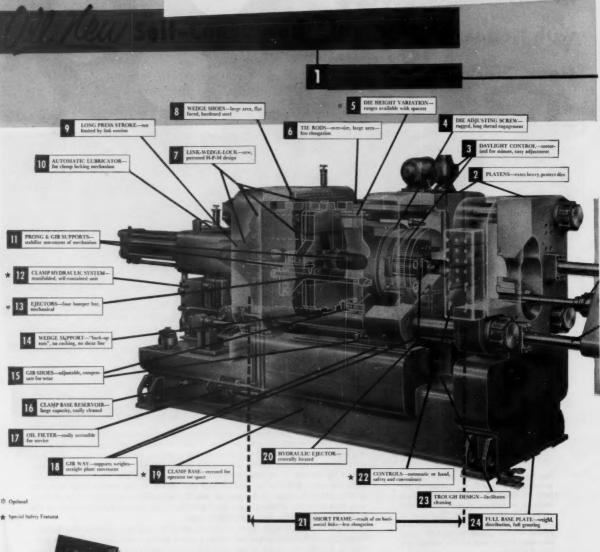
... a new way to check gear precision in action

To inspect all kinds of complex parts on a bright screen, Kodak also makes two highly versatile contour projectors.

Kodak

H-P-M Offers Much More Than a

NEW APPROACH





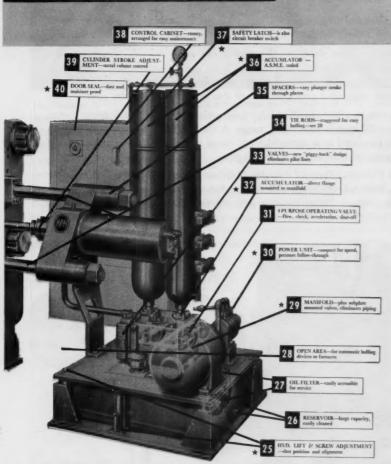
40 Proven Performance Features—

are illustrated and explained in detail in H-P-M's new die casting machine bulletin. Specifications on Cold Chamber and Gooseneck machines also shown.

Write for your free copy of Bulletin No. 5400 today!

New Machine Design...SEE THIS

TO DIE CASTING!



GREATEST Advance In Die Casting Machines In 15 Years!

 Here's the machine die casters have been looking for . . . H-P-M's brand new approach to die casting!

More than 40 new and improved performance features . . , revolutionary new self-contained injection end and clamp end design . . . many important, exclusive H-P-M design contributions are combined in the new H-P-Ms to give you the ultimate in die casting machine performance.

Cold Chamber machines . . . for aluminum, brass and magnesium alloys . . . are available in 200, 400, 600, 800 and 1000 ton capacities as standard and up to 3000 tons on special order. Gooseneck models . . . for zinc, lead and tin . . . include standard 100, 250, 400 and 600 ton machines and up to 1500 ton capacities on special order.

Be the first to cash in on higher production . . . better quality parts of high density, close tolerances and superior finish . . . with minimum scrap or salvage. Get the facts on the most advanced die casting machine in the industry from an H-P-M sales engineer today!

THE HYDRAULIC PRESS MFG. COMPANY

1042 Marion Rd., Mount Gilead, Ohio, U.S.A.

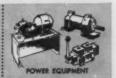












For Every Pressure Processing Need!



front operated back gauge

... allows quick, accurate adjustment of back gauge from front of shear to 1/128ths inches, with setting indicated on dial assembly calibrated in 1/64ths.

accurate back gauge settings at your fingertips

Many time and step-saving features make the Columbia "New Series" power squaring shears the leaders in industry for fast, truly convenient operation.

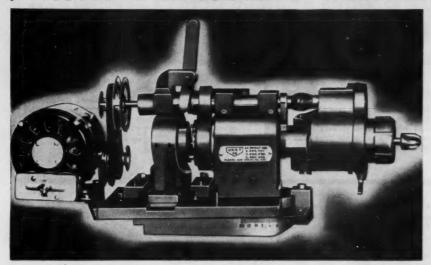
For example, with the Front Operated Back Gauge, a simple twist of the dial adjusts the gauge to 1/128ths inches. On the shear shown below, actually 4608 precise settings are at the operator's fingertips in front of the shear. A special motorized arrangement can also be included at extra cost.

All shears in 3/16", 1/4" and 3/8" capacities have a 24" back gauge range, while 1/2" models have a 36" range. A special swing-up type back gauge can be furnished as an extra with 36" range gauges for cutting metal beyond that range without removing the angle.

Other Columbia features you should know about include the exclusive air clutch, blade clearance indicator, hydraulic hold-downs, jog control for ram and others. These, together with rigidity and long-lasting accuracy, mean that Columbia Shears offer more machine for the money.



Precision CIRCULARITY GRINDING ATTACHMENT



Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, radial relief, form and radial relief together, tapered cylindrical and straight cylindrical. Cutting tool to be produced or reworked is held in collet or between dead centers and revolves on its own axial center. Where full length of spiral cutting tools is to be ground for both form and radial relief, the Circularity Grinding Attachment travel is similar to an O.D. grinder, which insures fine finish, back taper and accurate size.

The Detroit Reamer & Tool Company Model 500 Circularity Grinding Attachment shown above is faster, easier to handle, has positive control, greater adaptability, rugged construction, and is engineered and precision built to provide the finest in precision work. Therefore, it will be of invaluable assistance to anyone whose tooling standards must meet modern production requirements.



You Can Grind
Tools Like These
on a DETROIT REAMER
CIRCULARITY GRINDING
ATTACHMENT

Special Cutting Tools of DEPENDABLE QUALITY



The Detroit Reamer & Tool Co. Plant is equipped with the finest in modern machinery and inspection facilities to provide you with the ultimate in precision tools. Our Engineering and production personnel with 35 years of empirical

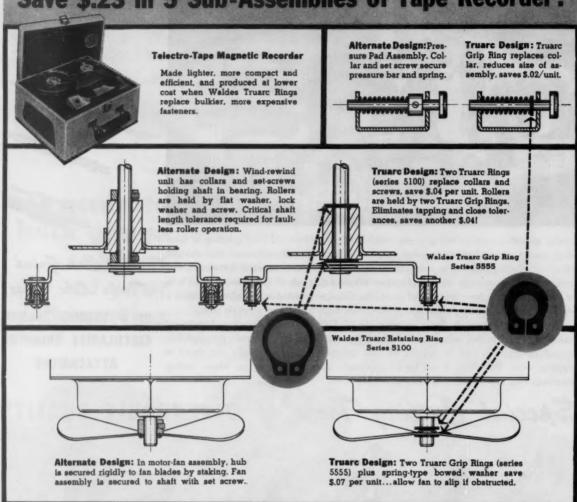
knowledge behind them are completely qualified to expertly handle your tool needs. For dependable cutting tools—specify Detroit Reamer & Tool Co.

DETROIT REAMER & TOOL CO.

2830 E. SEVEN MILE ROAD . DETROIT 34, MICH.



13 Waldes Truarc Rings Replace Bulky Fasteners... Save \$.23 in 5 Sub-Assemblies of Tape Recorder!



- By using Waldes Truarc Retaining Rings in five sub-assemblies (three shown above), the Telectrosonic Corp. of Long Island City, N. Y., saves a total of \$.23 per unit...by eliminating material, machining and skilled labor costs.
- You, too, can cut costs with Truarc Rings. Wherever you use machined shoulders, bolts,

snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Waldes Truarc Rings are precision-engineered...quick and easy to assemble and dis-assemble.

Find out what Truarc can do for you. Send your blueprints to Waldes Truarc engineers for individual attention without obligation.

Write for a copy of the latest Truarc catalog.



RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

precision internal grooving and undercutting ... Waldes Truarc Grooving Tool

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OF MORE OF THE FOLLOWING U.S. PATENTS: 2,382,947; 2,382,948; 2,418,852; 2,428,941

A REVOLUTION

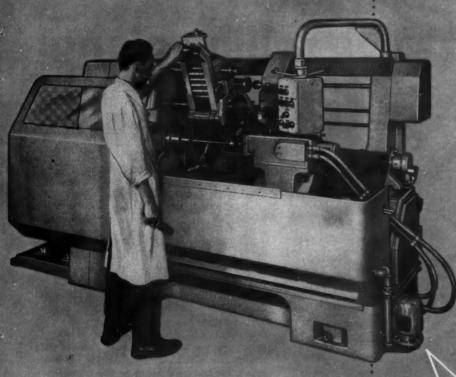
IN TURNING METHODS!



PILOT

high speed Hydraulic copying lathe

for complete automation!



This H. E. B. PILOT – built by IMPCO, Lansing, Mich. — is now copy-turning transmission parts in the plant of one of the country's leading automotive manufacturers. Of course the job could have been done on any of half a dozen ordinary machines — but only the PILOT holds tolerance to .001" both on diameter and length using only two tools!

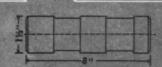
Operation is so easy one man can handle three machines at once. He has only to load the simplified hopper and the PILOT rapidly does the rest automatically — including ejection of the finished parts onto a conveyor.

The PILOT'S simple tooling permits great savings in the cost of expensive carbide tools, and downtime for tool changes is slashed drastically.

The H.E.B. PILOT results in enormous savings in the turning of many parts. Because of the accuracy and finish obtained, subsequent grinding is also reduced tremendously, if not eliminated altogether. For a demonstration or our comprehensive catalog, write, wire or telephone us now.

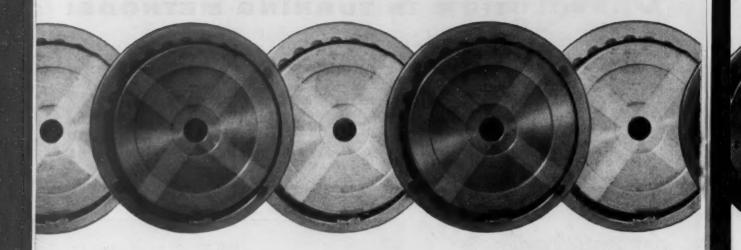
 $\mathbf{H} \cdot \mathbf{E} \cdot \mathbf{B}$

Copying Lathes
Engine Lathes
with Copying
Attachments
Tool Room Lathes
Carbide Tool
Grinders



Automotive transmission part copy-terned in a total time of 50 necends using just I tools and helding a tellirance of J801".

H. E. B. MACHINE TOOLS, INC.



they just keep rolling along!

Oil changed only 3 times in 15 years

■ Here's the kind of a job where a lubricant either has to "put up" or get out.

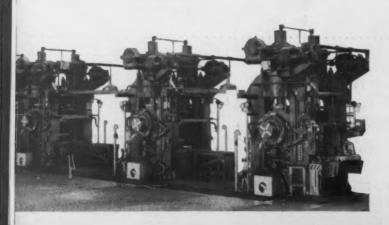
Above and at right you see closeups of the tremendous bearings in the cold reducing mill of the Greer Steel Company, Anderson, Indiana. These are subjected to shock loads and continual extreme pressures. If there ever was an application where an oil has to prove itself beyond a question of a doubt this is it.

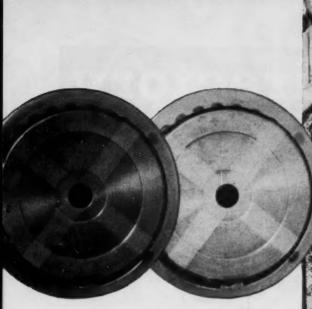
For the past fifteen years, STANOIL Industrial Oil \$240 has been proving itself day in, day out by putting up the best lubrication possible on this tough job. And yet, despite continuous hard operation, this oil has been changed only three times in this entire period! The big bearings under continual heavy pressure have been successfully protected by STANOIL and have remained as good as new. Lubricant consumption has stayed low . . . with no evidence of any sludge or varnish formation. Periodic checks by the Standard Oil Lubrication specialist insure the continued like-new quality of the oil. That means that these vital mills will keep rolling along free from any lubrication difficulties.

Standard Oil lubrication specialist Don Wilson puts



his training and experience to work to help Greer maintain economical, trouble-free operation. For help with your lubrication program call your nearest Standard office or write to Standard Oil, Chicago.





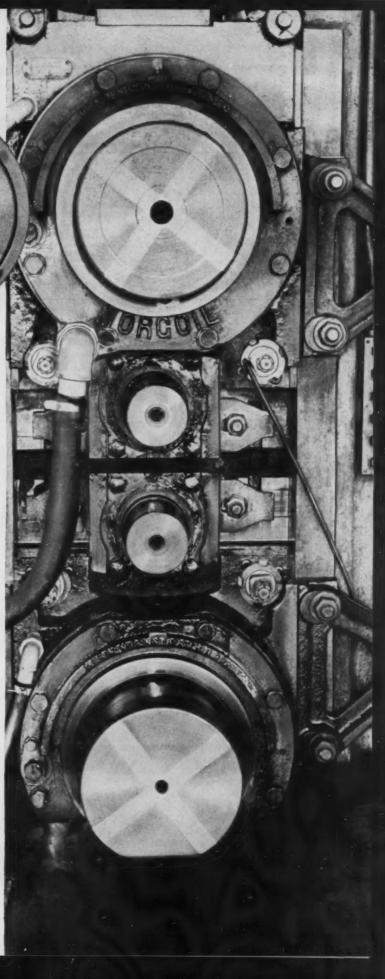
STANOIL TRADE MARK Industrial Oil

STANOIL Industrial Oils are vercatile, multipurpose oils designed to do a variety of jobs in a wide range of equipment. STANOIL can simplify stock, storage, and inventory in your plant by replacing many special-purpose oils you may now be using on air compressors, reduction gears, electric motors, auxiliary turbines and other equipment. For sure protection and better operating economy check today on the superiority of STANOIL.



STANDARD OIL COMPANY

(Indiana)



Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

See Discs, Abrasive

ABRASIVES, HONING

Barnes Drill Co., 814 Chestnut St., Rockford,

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Norton Co., 1 New Bond St., Worcester 6, Mass. Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Bethiehem Steel Co., Bethlehem, Pa. Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn. Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y. Morgan Engineering Co., Alliance, Ohio. Vickers, Inc., 1402 Oakman Bivd., Detroit, Mich. Watson-Stillman Co., Div. H. K. Porter Co.,

Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

AIR HOISTS-See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa. Vanadium Alloys Steel Co., Latrobe, Pa. Wheelock, Loveloy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N., Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ALLOYS, Zinc

New Jersey Zinc Co., 160 Front St., New York, N. Y.

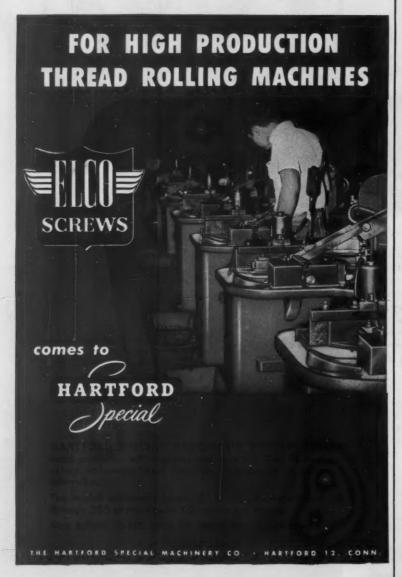
ARBOR PRESSES

See Presses, Arbor

ARBORS AND MANDRELS

ARBORS AND MANDRELS

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Truist Drill Works, 411 W.
Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland Ohlo.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohlo.
Danly Machine Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, Ill.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Gorton, George Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St.,
Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester,
Mich.
(Continued on page 320) (Continued on page 320)





Gains Longer Life, Greater Visibility, Safety and Simplified Design

It has been said that for a number of years very few improvements have been made in open hearth charging machines used in steel mills. Here too a consideration of Oilgear Fluid Power equipment led to some valuable and important progress.

The Morgan Engineering Company, a leading manufacturer in the field, decided that much could be gained by the use of oil hydraulics and designed its 10-ton charging machine accordingly. Morgan uses the following Oilgear Fluid Power equipment: a hydraulic pump with a volume of 60 gallons per minute at 1700 psi pressure; 2 hydraulic cylinders for the hoist; one cylinder for the peel clamping device; two 4-way control valves located near the pump operated in turn by two pilot valves in the operator's cab; and a cam operated relief valve on the peel clamping device.

The company gained the following advantages: on the hoist, the conventional large hoist motor with its reduction unit is eliminated giving the operator maximum visibility and of course surer operation. The hydraulic cylinders used eliminate the conventional crank motion used hitherto exclusively.

The peel clamping device is actuated by one hydraulic cylinder, felt to be a definite improvement. It was found that hydraulic clamping is adequate by itself and the usual locking device was eliminated. More important, hydraulic clamping prevents oscillation of the boxes

while the peel is being rotated and this prolongs the life of both peel head and boxes.

The cam operated relief valve is a safety measure, preventing the operator from lifting the box antil the locking rod has been correctly located in the box head well.

Since this application has proved so satisfactory, the Morgan Engineering Company has applied Oilgear Fluid Power Equipment to other types of charging machines, to hot saws, inverted and portable strippers as well.

Designers should bear in mind the advantages cited above are in addition to the fundamental Oilgear advantages of flexibility, wide range of power, infinitely and steplessly variable speed range, unlimited ratios, smooth cushioned acceleration and shockfree hydro-dynamic braking, simplified and accessible hydraulic design well ahead of J.I.C. standards, a range of application from the handling of the most delicate and fragile webs up to the most massive power requirements. You are invited to submit your problem to Oilgear. It will cost you nothing to do so; it may prove to be one of the most profitable steps you have ever taken. THE OILGEAR COMPANY, 1569 W. Pierce St., Milwaukee 4, Wisconsin.





PAINTS BODIES WITH RANSBURG



Automatic electrostatic spray enables Studebaker to apply a heavier and more uniform primer surfacer while giving them a net saving of 1.81 per body in paint and direct labor. Not only is the Ransburg method providing the desirable increase in uniform film thickness, but it is enabling Studebaker to paint more bodies per hour with the substantial savings in paint and labor over the former hand spray method.

The heavier, and enduring, first coat on Studebakers provides the necessary base



for the superior finish . . . a finish which resists all kinds of exposure conditions, such as combinations of warm and humid climate, and prolonged bright sun exposure.

> Whatever your product may be-large or small—if your production volume justifies conveyorized painting, chances are that one of the RANSBURG electrostatic processes can do the job better, and for less. Write or call for data and detailed information on numerous and varied installations.





Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Supreme Products, Inc., 2222 So. Calumet, Chicago 16, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

BARBITT

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa. Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, III.

BALANCING EQUIPMENT

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III.

Casa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Olsen, Tinius, Testing Maching Co., Philadelphia, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St., Rockford, III.

Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Republic Steel Corp., Union Drawn Steel Div., Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson Joseph T. & Son, Inc., 2558 W. 1415. Ohio.

Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

Timken Roller Bearing Co., Canton, Ohio.

U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

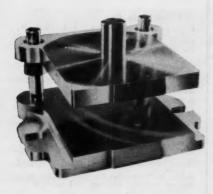
Bunting Brass & Bronze Co., Spencer and Carl-ton Ave., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa. Link-Belt Co., 2410 W. 18th St., Chicago 8, III.

BEARINGS, Ball

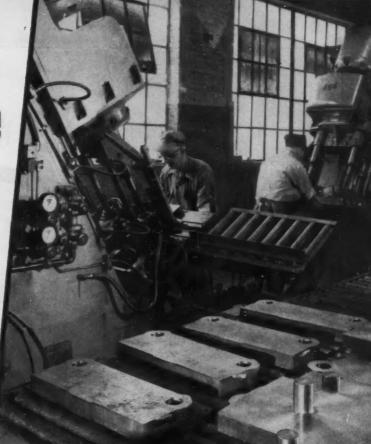
BEARINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Farini Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St.,
Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Mariin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
New Departure Div., General Motors, Bristol,
Conn.
Nice Ball Bearing Co., Nicetown, Philadelphla,
Pa. Norma-Hoffman Bearings Corp., Stamford, Conn. Torrington Co., Torrington, Conn.

(Continued on page 322)

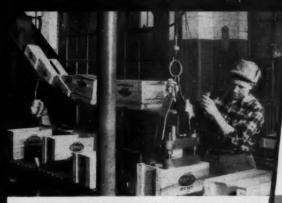
Fastest die set service ever



... made possible by Danly's unique mass-production and distribution system.



At the main Danly plant . . . high spend precision drilling. Inserchangable fixtures accommodate the full range of standard die set sizes.



At your Danly Branch plant...shipping die sets to your order. Up-to-date procedures and facilities assure fastest delivery.

To make your tooling program move faster, Danly mass produces interchangeable, precision die set parts . . . stocks them at your local Danly Branch ready for quick assembly to your order and delivery to you. With Danly, from the time you place your order until the set is delivered to you is a matter of only a few days. This extra fast delivery starts at the main Danly plant in Chicago where two complete high-speed production lines turn out a wide variety of precision die set parts. Held in ample stock by your local Danly Branch, these interchangeable parts are assembled to your order and delivered immediately. Don't let lagging die set delivery bog down your tooling program. Order from your Danly Branch and get the fastest service . . . ever.

Fast, nationwide delivery from these branch plants

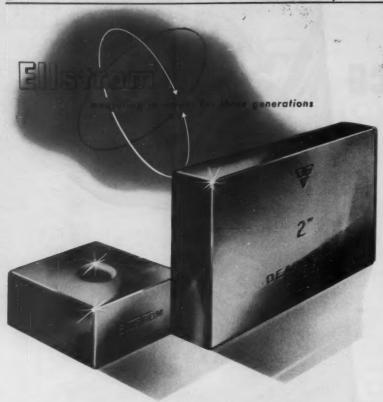


DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue Chicago 50, Illinois

*SHICAGO 50	
*CLEVELAND 14	1550 East 33rd Street
PAYTON 7	3196 Delphos Avenue
POETROTT 16	1549 Temple Avenue
GRAND PAPIDS	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
*LONG ISLAND CITY 1	47-28 37th Street
*LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKES 2	111 East Wisconsin Avenue
*PHILADELPHIA 40	511 W. Courtland Street
-ROCHESTER 6	

*Indicates complete stoc



No finer GAGE BLOCKS at any price!



By any comparison you care to make . . . blockfor-block, set for set . . . you'll find Ellstrom Chromium Plated Standards truly outstanding in the field of precision measurement. Materials used in their manufacture are precisely treated and thoroughly tested for coefficient of expansion, uniform hardness, and metallurgical stability. The durable chromium plated gaging surfaces are applied and finished by special Ellstrom methods which assure you of greater serviceability, longer wearing millionths. And flatness, parallelism, and specified accuracy of each individual block is fully certified by the most uncompromising final inspection found anywhere in the industry.



So next time you need gage blocks, specify Ellstrom Standards. Furnished in 28 basic sets, either square or rectangular styles, with block sizes in step series from .010" up to and including 20.000". Basic accessories also available . . plus tungsten carbide wear blocks and individual blocks to meet your specific requirements.



IF YOU BUY GAGE BLOCKS, you should have this handy new Ellstrom Standards Catalog. Contains complete specifications and prices in convenient tabular form . . . and a copy is yours for the asking. Send for it today!

ELLSTROM STANDARDS DIVISION Dearborn Gage Company · 22035 Beech Street · Dearborn, Mich.

Originators of Chromium Plated Gage Blocks

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

BEARINGS, Bronze and Special Alloy

Bunting Bross & Bronze Co., Spencer & Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8,

BEARINGS, Lineshaft

Fofnir Bearing Co., New Britain, Conn. Link-Belt Co., 519 N. Holmes Ave., Indian-apolis 6, Ind. Orange Roller Bearing Co., Inc., Orange, N. J. Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

Kaydon Engineering Corp., McCracken St., Muskegon, Mich. Orange Roller Bearing Co., Inc., Orange, N. J. Torrington Co., Torrington, Conn.

BEARINGS, Roller

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St.,
Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Mariin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Railway Bearings Co., Inc., 541 Seymour St.,
Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilness)

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller

Kaydon Engineering Corp., McCracken St., Muskegon, Mich. Timken Roller Bearing Co., Conton, Ohio. Torrington Co., Torrington, Conn.

BEARINGS, Thrust

BEARINGS, Thrust
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St.,
Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia,
Pa.
Norma-Hoffman Bearings Corp., Stamford. Pa.

Norma-Hoffman Bearings Corp., Stamford,
Conn.

Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

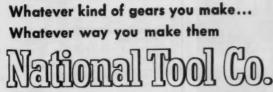
BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, Transmission

Houghton, E. F. & Co., 303 W. Lehigh Ave., Philodelphia, Pa. Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind.

(Continued on page 324)



can supply the right type cutting tool because we make all types

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes all varieties of gear cutting tools for all types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.

Gear Shaving Cutters

Hobs

Rack Type Gear Shaper Cutters

1

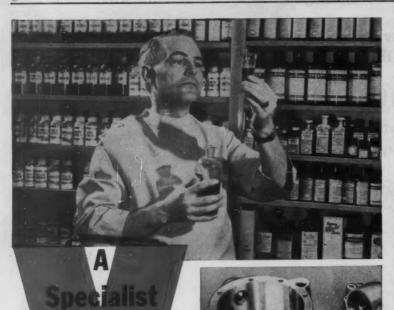
Involute Gear Cutters

Muster Gear

National

Cleveland 2, Ohio

Representatives in major industrial centers



You can depend upon Vinco production specialists to mass produce precision parts to your specifications the same as you depend upon a pharmacist to fill your prescription.

Facilities in the production plant at Vinco are set up to mass produce parts rapidly and in-expensively from ferrous and non-ferrous metals. Personnel is skilled in operating the automatic and semi-automatic equipment. An efficient quality control system is based upon a completely equipped inspection laboratory.

You save both time and money because Vinco made parts are within specified tolerances, thus assuring proper assembly.

Have Vinco produce com-ponent parts for you and learn why a specialist is your best bet.

VINCO CORPORATION, 9113 Schaefer Hwy., Detroit 28, Mich.

Metal Component Parts Mass Produced • Aircraft and Commercial Gears • Model B-1 Dresser • Precisiondex • Spline Gages Master Gears • Gear Rolling Inspection Fixtures Camshaft Comparators
 Optical Master Inspection Dividing Heads • Involute Checker.

BENCHES, Work, and Bench Legs Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.

Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. Verson Allsteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, III.

BENDING MACHINES, Hydraulic

DENDING MACHINES, Hydraulic
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati,
Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North
Duke St., York, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave. Hiraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niogara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa. Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT

Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich. Pangborn Corp., Hagerstown, Md. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, Ingersoil-Rand Co., Phillipsburg, N. J.

BLUING LAYOUT

Dykem Co., 2303P. N. 11th St., St. Louis 6,

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Steel and Tubes Div.,
Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
U. S. Steel Corp., National Tube Co., Div.,
436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Hill Acme Co., 1201 W. Sall St., Ohio. Landis Machine Co., Inc., Waynesboro, Pa. National Machinery Co., Tiffin, Ohio. New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only) Bethlehem Steel Co., Bethlehem, Pa. National Acme Co., 170 E. 131st St., Cleve-land, Ohio. Ottemiller, W. H., & Co., York, Pa. Republic Steel Corp., Balt & Nut Div., Republic Bldg., Cleveland 1, Ohio. Russell, Burdrall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y. (Continued on page 326)

Announcing

a completely AUTOMATIC, self-contained, ONRTABLE drilling unit with advantages you expect only in expensive machine tools



Peck drilling four deep holes in a magnesium casting

THE NEW SERIES 92A KELLER "AIRFEEDRILL"

- -locks to any jig or fixture, and drills accurately. Stationary mounting brackets available
- --- operates automatically through the complete drilling cycle-advances, drills, retracts, shuts off-at a single pressure of the control
- -handles peck drilling and skip drilling
- -gives complete control over motor speed, drilling speed, torque, rate of advance, and depth of hole

It has these operating features:

SENSING TYPE RAPID ADVANCE brings the drill point quickly to the work, then drops instantly to the drilling rate.

TORQUE CONTROL causes automatic retraction as often as necessary to clear chips during peck drilling. It also protects drills and indicates when they need sharpening.

FEED CONTROL permits adjustment to varying drilling conditions, as well as the material being drilled.

VARIABLE SPEED MOTOR controlled by throttle valve ... shuts off automatically at end of drilling cycle.

These and other features mean that you can tool up for a few hundred dollars . . . instead of thousands. Send for Catalog Section 92 which fully describes and illustrates this remarkable



KELLER Äirfee

KELLER TOOL COMPANY, 1307 Fulton St., Grand Haven, Mich.

Lightweight and compact-

ideal for use in portable or



Eversharp-Schick specified dies to mass produce a razor of superior quality . . . flawless operation . . . competitive price. Working against a tight schedule, B. Jahn evolved a series of progressive dies that turned out each individual metal component used in the razor! Every close tolerance was faithfully met — all specifications of die performance were adhered to - every requirement of product quality and accuracy was engineered and built into the dies by B. Jahn. To guarantee customer satisfaction, components were submitted to Eversharp-Schick for actual assembly line use before the dies were certified "PRODUCTION PROVED" and shipped!



12 STATION DIE RIBBON



7 STATION DIE RIBBON



9 STATION DIE RIBBON



5 STATION DIE RIBBON 3 STATION DIE RIBBON 3 STATION DIE RIBBON



Send today for the fact-packed, picture story of "B. Jahn Production Proved



THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

BORING AND DRILLING MACHINES
Baker Bros., Inc., Sta., F. P. O. Box 101,
Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Conedy-Otto Div. Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland
8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrs. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
20, Mich.

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. Bullard Co., Brewster St., Bridgeport 2, Conn. Cosa Corp., 405 Lexington Ave., New York 17, Cosa Corp., 405 Lexington Ave., 12. N. Y.
Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING BARS

BORING BARS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Bullard Co., Brewster St., Bridgeport 2, Conn. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Ex-Cell-O Copp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich. Gairing Tool Co., 21223 From 32, Mich. Ingersoll Milling Mch. Co., 2442 Douglas St., Ingersoll Milling Mch. Co., 2442 Douglas St., Mead-32, Mich. Ingersoll Milling Mch. Co., 2442 Douglus S., Rockford, III. McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa. Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III. Universal Engineering Co., Frankenmuth 2, Mich. Williams, J. Has Co., 400 Vulcan St., Buffalo

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)
Cincinnati Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit
32, Mich.
Giddings & Lewis Machine Tool Co., Fond du
Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn.
R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co.,
12302 Kirby Ave., Cleveland 8, Ohio.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.

(Continued on page 328) (Floor, Planer or Table Types) (Continued on page 328)

You can produce MORE for LESS with

"ONE STOP" TOOLING SERVICE



Profit, today, must come from production . . . with overhead, sales, labor, and material costs at constant or increasing high levels. The need to produce more product for the same money or the same volume of product for less

money makes tooling the key to profit!

Only Firth Sterling can serve you so completely in solving the tooling problems that enable you to make production profits...for these six convincing reasons:

UNBIASED RECOMMENDATIONS Because Firth Sterling makes both steel and carbide tooling materials, you get completely unbiased recommendations. The exactly right tools or tooling materials will be matched to your production needs, resulting in better, faster, cheaper production.



UNLIMITED SELECTION Only Firth Sterling offers so many grades, styles and sizes of both steels and carbides from one source of supply ... 16 High Speed Steels, 53 Tool and Die Steels, 6 High Temperature Alloys, 12 Tungsten Carbides embracing standard tools and tips, toolholders and inserts, dies, perforators, and "specials" plus Chromium Carbides, Stainless Specialties, Titanium Carbide Cermets, Firth Heavy Metal, and Zirconium!



EFFECTIVE NATIONAL DISTRIBUTION Three plants, 4 warehouses, 11 branch offices and 135 distributors strategically located in the manufacturing centers of the country assure readily accessible supply sources for all your tooling needs.



CONSTANT RESEARCH Continuing full-scale research with emphasis on product improvement, specialty steels, carbides, new metals and new methods assures you years-ahead tooling procedures when you make Firth Sterling your one-stop source of supply.



PACKAGED TOOL LINE The most complete line of packaged tools available comes in standard quantities, easy to handle, stock, identify and inventory . . . in both steel and carbide.



ONE SOURCE MAKES SENSE Yes, only Firth Sterling can so adequately provide one-stop, one-source-of-supply tooling service with its assurance of unbiased recommendations, simplified lower-cost ordering . . . resulting in better, faster, cheaper production. It makes sense, doesn't it? Ask Firth Sterling to analyze your tooling problems . . . to produce more for less.

h Sterling

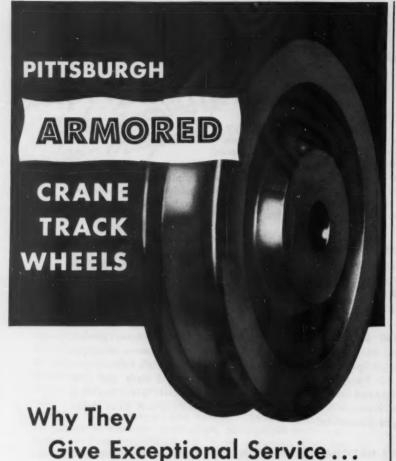
GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES AND WAREHOUSES": BIRMINGHAM CHICAGO" CLEVELAND DAYTON DETROIT" HARTFORD"
HOUSTON LOS ANGELES" NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels Tool and Die Steels Stainless Specialties High Temperature Allo Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets

Zirconium



• The secret of the long life of PITTSBURGH Armored Crane Wheels lies in something you can't see. It's part of the process perfected by PITTSBURGH which puts the right hardness in the right places. The treads and flanges are armored to the extra hardness of 601-712 B.H.N. 81-95

• This combination of hard treads and tough cores gives average service life up to five times that of untreated gears. It is your assurance of lower crane wheel costs. And PITTSBURGH gives you a written guarantee that you'll get this exceptional service.

SC. But the cores? They are left tough and highly resistant to shock.

Available in sizes from 10" to 30" diameter. Treads: flat, tapered, radius, or "Pittsburgh Gear Company Standard." Bores and hubs may be finished by you or by us to your specifications.

Do This Today: Send us specifications of the wheels you use and we'll quote on PITTSBURGH Armored Crane Track Wheels ... guaranteed to give longer service.





subsidiary of BRAD FOOTE GEAR WORKS, INC. . CICERO 50, ILLINOIS

Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
20, Mich.

BORING HEADS

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
McCrosky Tool Corp., 1938 Thomas St., Meadwille, Pa.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Mummert-Dixon Co., Hanover, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

BORING MACHINES
Bryant Chucking Grinder Co., Springfield, Vt.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
National Automatic Tool Co., Inc., 5. 7th and
N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Comp.
Simplex Machine Tool Corp., 4528 W. Mitchell
St., Milwaukee, Wis.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y. American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Yratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

BORING TOOLS

BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.

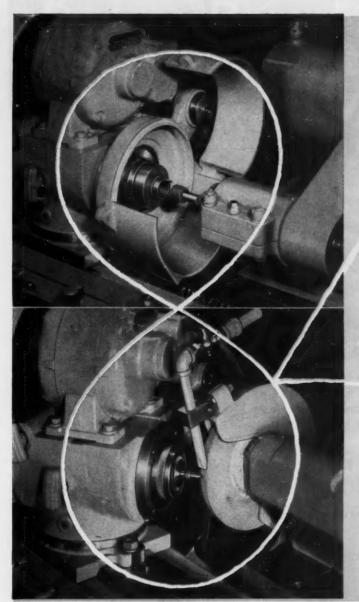
Bullard Co., Brewster St., Bridgeport 2, Conn. Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth Stefling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich. Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis. Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa. (Continued on page 330)





MODEL 84

INTERNAL-EXTERNAL GRINDER



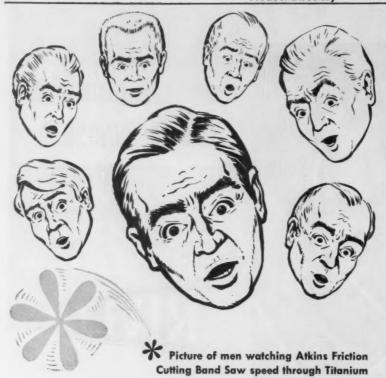
This small hole grinder mounts interchangeable wheelheads for internal and external spindles. Hole capacity is 3" dia. with a maximum depth of 4"; external is to 3" dia. by a 4" length. Collets and step chucks mount directly in lathe-type spindle.

This flexibility combined with the inherent accuracy is why the Rivett 84 has gained great popularity in toolrooms since its introduction to the trade twelve months ago.

Quick and easy to set up, the 84 will handle your diversified jobs faster, too. All the details to prove this are shown in Catalog No. 84-A. Write for a copy today!



RIVETT LATHE & GRINDER, INC., DEPT. MR-11. BRIGHTON 35, BOSTON, MASS.



No metal is too hard . . . no job too tough for Atkins sensational new friction-cutting band saw!

Specifically developed by Atkins to cut metals like titanium and stainless steel castings, this miracle band saw now sets new speed records whenever used!

ATKINS BAND SAWS GIVE YOU BETTER CUTTING ON EVERY METAL-EVERYTIME!

- Skillfully Milled—Newly developed technique—guarantees uniform teeth.
- Accurately Set-Machined to exacting tolerances-perfect clearance, clean cutting.
- Expertly Hardened—Tempered for long life.
- Specially Welded—Band-welds are strength-tested to outlast the cutting edges.
- Choice of Types, Set, Teeth available.

ATKINS SAW DIVISION

BORG-WARNER CORPORATION INDIANAPOLIS 9, INDIANA



Metal Carbides Corp., Youngstown, Ohio. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, III. Super Tool Co., 21650 Hoover Rd., Detroit 13, Cago C., 21000 Co., 21000 Co., Mich.
Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Mich.
Mich.
St., Buffalo

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

BRAKES, Press and Bending
Bliss, E. W., Co., 1375 Raff Road, S. W.,
Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Columbia Div., Lodge & Shipley Co., Hamilton
1, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd.,
Chicago 36, III.
Ferracute Machine Co., Bridgeton, N. J.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co.,
Inc., Roselle, N. Y.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich. Mich.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta.,
Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson,
Mass 32, Micn.
Lopointe Mch. Tl. Co., Tower St.,
Mass.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich. Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.
Mich.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
Pittsburgh Plate Glass Co., Brush Div., Baltimore 29, Md.

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. (Portable Elec.). Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Boldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Lake Erie Engineering Corp., Kenmore Station,
Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co.,
Inc., Roselle, N. J.

BURS

See Files and Burs, Rotary (Continued on page 332)

Reduce Broaching Costs ON SMALL JOBS

SERRATIONS
KEYWAYS
SLOTTING
BURRING
SIZING HOLES

Here is your epportunity to reduce machine time and cut production costs on those small breaching jobs. And you avoid trying up your regular breaching machines which are built for heavier work.

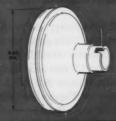
The Red Ring Self-contained Broaching Fixture is a compact, portable, bench-type unit. Specifically designed for a particular job, it has all the elements (automatic and manual) of any well designed fixture. A pneumatic cylinder is added to pull or push the broach. Just connect it with the air supply and you are ready to start broaching.

These Red Ring Fixtures are used on a wide range of small jobs requiring a "Pull" not to exceed 2000 lbs. and a stroke of 25" or less. Here they are highly effective and very economical.

Investigate—talk with a Red Ring Engineer or write for Bulletin B54-9.











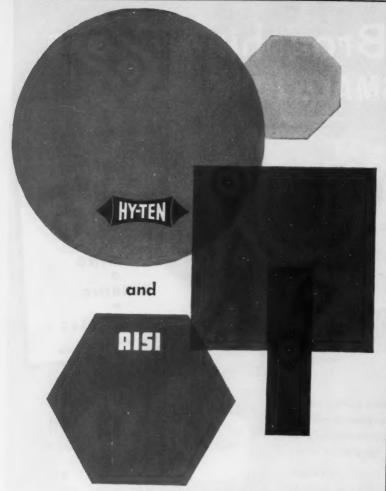




NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



bars, billets and forgings in sizes, shapes and treatments for every need!

Wheelock, Lovejoy & Company, Inc., can fill your alloy steel requirements promptly. This applies to both standard AISI and SAE steels and to our own HY-TEN steels-"the standard steels of tomorrow". Take advantage of our seven strategically located warehouses. All of them can supply these steels in the form and quantity you need. Every warehouse, too, is staffed with expert metallurgists who are ready to serve you.

Write today for your FREE copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

near you . . .

Warehouse Service—Cambridge • Cleveland • Chicago Hillside, N. J. • Detroit • Buffalo • Cincinnati In Canada-Sanderson-Newbould, Ltd., Montreal and Toronto



WHEELOCK, LOVEJOY & COMPANY, INC.

138 Sidney Street, Cambridge 39, Mass.

BUSHINGS, Brass, Bronze, Carbide, Etc. Bushinus, Brass, Bronze, Carbide, Etc.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened

BUSHINGS, Hardened
Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Leland-Gifford Co., 1025 Southbridge St.,
Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh,
Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere,
N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

CALIPERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Fellows Gear Shaper Co., Springeld, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sunstrand Machine Tool Co., 2531 11th St.,
Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N.J. N.J. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

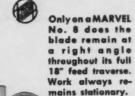
Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa. Kennametal, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Ohio. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Mich.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Corp., 1340 W. Vernor
Hwy., Detroit I, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating (Continued on page 336)

Never Confuse the No. 8 MARVEL with an ordinary Band Saw

... only the MARVEL is Universal





Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle without moving the





Only a No. 8 MARVEL can do all of these things: Snip-off a 1/8" rod or cut-off an 18" x 18" cross section



Rough to Size and Shape

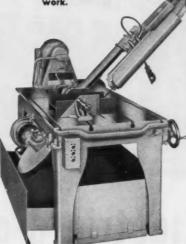


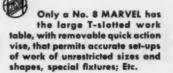
Mite





cut off and shape Structural Beams.





"Rough Machine" to size and shape with minimun chip waste

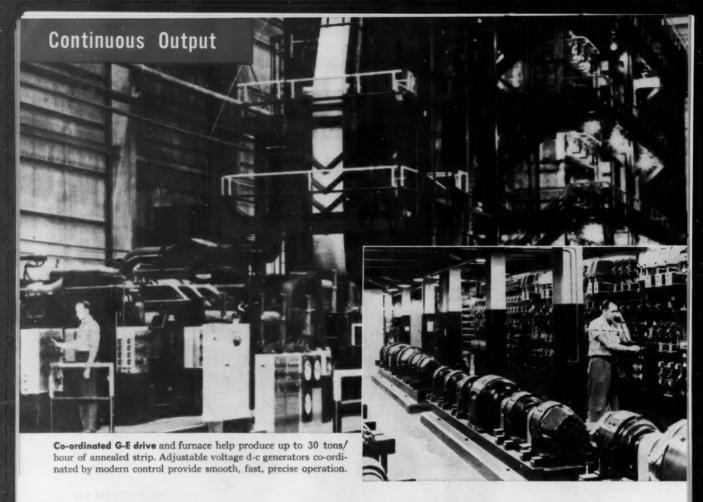
The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a universal tool-has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACH-INE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.





ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.



How General Electric d-c drives

Accurate Speeds



help make production automatic

DC MOTORS STEP UP PRODUCTION THROUGHOUT INDUSTRY

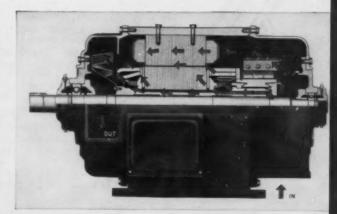
DC drives give you precise control of torque, speed, and power essential in automatic production. The degree of precision depends on the steady performance and continuity of service of d-c motors and generators. In applications requiring close speed regulation, quick reversing, severe peak loads, G.E.'s complete line of Type CD-1000 motors is:

ECONOMICAL—the right speed at all times means less waste, fast production and low manufacturing costs per unit.

EASY TO MAINTAIN—built for long life with occasional inspection only—easily removable inspection covers. All connections are enclosed, yet easily accessible.

VERSATILE-Today's industry is more automatic than ever before. Regardless of application—in steel, paper, machine tool, and many other industries-G-E direct-current motors have gained the reputation of delivering continuous output at lower costs and accurate speeds for peak production.

FOR MORE INFORMATION, contact your nearest Apparatus Sales representative, or write for bulletin GEA-5497, general-purpose d-c motors, or GEA-6091A, totally-enclosed unit-cooled d-c motors. Section 810-4, General Electric Co., Schenectady, N. Y.



Excellent ventilating system gives positive ventilation to entire motor. Shaft fan on armature helps dissipate heat, keep within specific temperature rise.

GENERAL ELECTRIC



FOR SPECIAL REAMERS . . . REMEMBER

They may not look alike, but all of the special tools on this page share a common function . . . because every one is a reamer! Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve your next production machining problem, too! Take advantage of our experience.

Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

Porkam TOOL COMPANY

EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14405 WOODROW WILSON **DETROIT 3. MICHIGAN** WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Baldwin-Lima-Hamilton Carp., Eddystone Div., Philadelphia 42, Pa. Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa. Bunting Brass & Bronze Co., Spencer and Carl ton Aves., Toledo, Ohio. Mueller Brass Co., Port Huron 35, Mich.

CASTINGS, Die

American Brass Co., Waterbury 20, Conn. Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. Addison-Kipp Corp., Madison, Wisc.

CASTINGS, Iron

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Brown & Sharpe Mfg. Co., Providence, R. I. Chambersburg Engineering Co., Chambersburg, Pa. Leuigh Foundries, Inc., 1500 Lenign Dr., Easton, Pa. Link-Belt Co., 180 W. Duncannon Ave., Phila-delphia 20, Pa. Foundries, Inc., 1500 Lehigh Dr.,

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa. Pa. Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. Lebanon Steel Foundry, Dept. J, Lebanon, Pa. Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa. U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn

CENTERING MACHINES

CENTERING MACHINES

Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and
Girard Ave., Philadelphio, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianoplis 5, Ind.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St.,
Rockford, Ill.

CENTERS, Lathe

CENTERS, Lathe

Axelson Mfg. Co., P.O. Box 15335, Verona St.,
Los Angeles S8, Cal.

Carboloy Dept., General Electric Co., Box 237,
Roossevel Park Annex, Detroit 32, Mich.

Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St. Chicago, Ill.

Eclipse Counterbore Co., 1600 Bonner Ave.,
Ferndale, Mich.

Ferndale, Mich.

Ferndale, Mich.

Ferndale, Mich.

Forbes St., Pittsburgh 30, Pa.

Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.

Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.

Kennametal, Inc., Latrobe, Pa.

Metal Carbides Corp., Youngstown, Ohio.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

South Bend, Ind.

South Bend, Ind.

Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.

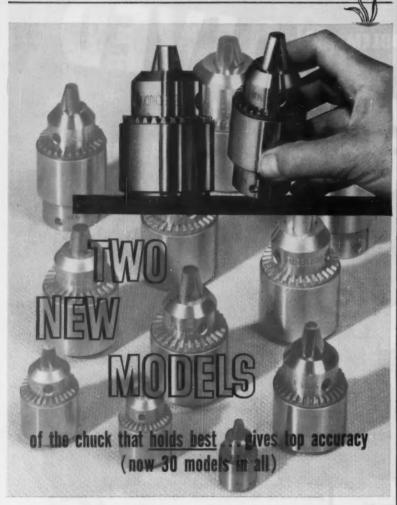
Wesson Co., 1220 Woodward Heights Blvd., St., South deadless of the state of the stat

CHAINS, Power Transmission and

Boston Gear Works, 3200 Main St., North Quincy, Mass. Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind. Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa. (Continued on page 338)



SUPREME is on the grow!



Industry has been asking for them. Now, after the most exacting on-thejob tests, Supreme Products, Inc. announce the addition of two new large capacity Supreme Brand Chucks to their ever-expanding line. They are:

(1) Model No. 9T3 with 3/16" to 3/4" capacity. (2) Model No. 15T33C, 0" to 1/2" capacity drill press chuck with ball bearing lock

collar.

With these two new chucks, Supreme now has a total of 30 separate and distinct models for the industrial and

2222 So. Calumet Avenue Chicago 16, Illinois

PRODUCTS, INC.

O.E.M. user to choose from. It means that the extra performance of Supreme is now available to virtually the entire metalworking industry. See and try Supreme Chucks. Learn why Supreme Chucks have become standard equipment on so many of the products of America's foremost tool manufacturers.



CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholf Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle),
Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.

Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.
National Acme Co., (Single and Multiple
Spindle) 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave.,
Pawtucket, R. I.
Sunstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 83, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schraders Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Gleason Works, 1000 University Ave., Roches-ter, N. Y. Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

CHUCKS, Drill
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
Supreme Products, Inc., 2222 So. Calumet,
Chicago 16, Ill.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

CHUCKS, Full Floating

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y. Gisholt Mch. Co., Madison 10, Wis. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, Ill. Universal Engineering Co., Frankenmuth 2, Mich.

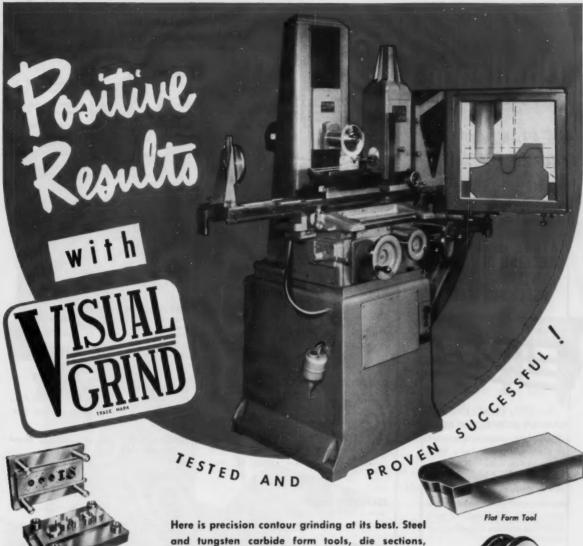
CHUCKS, Gear

Gleason Works, 1000 University Ave., Roches-ter, N. Y. Supreme Products, Inc., 2222 So. Columet, Chicago 16, III.

CHUCKS, Lathes, etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co. Brewster St., Bridgeport 2, Cann.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New
Briftain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

(Continued on page 340) Your Distributor







templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Workpiece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

Ask for Bulletin "M-11"



Circular Form Tool





IE CLEVELAND GRINDING MACHINE COMPANY

1643 EDDY ROAD

CLEVELAND 12, OHIO

Grinding Possibilities Optical





CHECKING, LAPPING.

WELDING AND

ASSEMBLY WORK

including CHALLENGE LAYOUT SURFACE PLATES in 16 sizes, precision ground or planer finished - for a wide range of functions. Plates can be grooved and keyed so that two or more can be assembled and mounted into one complete unit. With "T-Slots" or with grooving, scoring or machining.



SEMI-STEEL SURFACE PLATES

made of fine-grain special analysis semi-steel castings, heat treated. Three-point suspension with heavy, deep ribs on the underside.

PLUS . . .

Clamp Edge Layout Plates Checking Tables Welding Tables Bench Plates and Blocks

Send for free copy of Challenge Catalog showing complete line of precision equipment.

THE CHALLENGE MACHINERY CO.

Office, Factories and Show Room GRAND HAVEN, MICHIGAN

Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio. Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. Zagar Tool, Inc., 24000 Lakeland Blvd., Cleve-land 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

CHUCKS, Quick Change and Satety
Errington Mechanical Laboratory, 24 Norwood
Ave., Stapleton, S. I., N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St.,
Chicago, III.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
Universal Engineering Co., Frankenmuth 2,
Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y. Jacobs Mfg. Co., West Hartford, Conn. McCrosky Tool Corp., 1938 Thomas St., Mead-ville. Pa. Jacobs Mfg. Co., West Harrtorg, Cons. McCrosky Fool Corp., 1938 Thomas St., Mead-ville, Pa.
Procurier Safety Chuck Co., 18 S. Clinton St., Chicago, III.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.

CLAMPS

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave.,
Chicago 41, III.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Moss.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brew-ster St., Bridgeport 2, Conn. Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

CLUTCHES
Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrell-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., 23609 Hoover Rd., Van Dyke, Mich.
Link-Beit Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410
Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine Wis. Wis.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.

COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind. Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

COLLETS
Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmiro, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston S5, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Eastman Kodak Co., Rochester, N. Y. Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y. Jones & Lamson Mch. Co., Springfield, Vt. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y. N. Y. Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping). Oakite Products, Inc., 19 Rector St., New York, SN. Y.

Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich. Sinclair Refining Co., 600 Fifth Ave., New York.

Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill., Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.

Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y.

COMPOUNDS, Resin and Moulding

General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

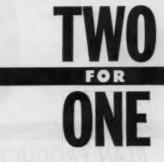
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Pillipsburg, N. J.

CONTOUR FOLLOWER

Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal. Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y. Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Blanchard Mch. Co., 64 State St., Cambridge, Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y. Eisler Engrg. Co., 760 S. 13th, Newark 3, N. J. (Continued on page 342)



with the Nichols Double-Decker!

The Nichols "Double-Decker" Two-spindle Miller actually gives you two milling operations in one pass! It is equally adaptable to small or large lot production of small parts where parallel flats or grooves, or opposed faces cannot be straddle milled, or otherwise must be indexed for two operations with a single cutter. Its time-saving features are readily apparent. Spindles may be separated from 4" to 7" (or more) to accommodate various sizes of cutters and work. Table can be arranged for hand operation or with automatic work cycle, and with high or low spindle speeds.

CONDENSED SPECIFICATIONS

Table Working Surface 6¾" x 21"
Longitudinal Travel 10"
Transverse Travel 7"
Center Distance of Spindles
Available Between 3¾" and 1

Available Between
Spindle Speeds Available
Net weight approx.

3¾" and 14¾" up to 5000 R.P.M. 1250 lbs.

Inquiries must be submitted in detail, as specifications and capacities are governed by user's needs.

MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

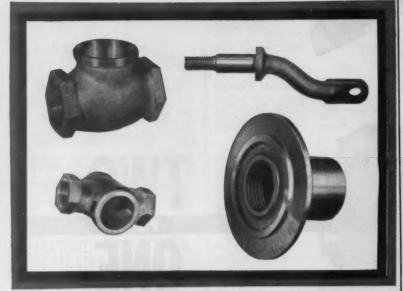
Write for catalog giving details on

lever, screw and air-feed models, plus

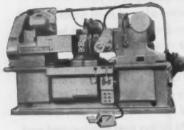
three types of double spindle Nichols Millers.

NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION

76-E Mamaroneck Ave. White Plains, N. Y.



PLAN PRODUCTION of PARTS LIKE THESE and MANY OTHERS . . . for speed, convenience and economy on GOSS & DeLEEUW **AUTOMATIC CHUCKERS**



4-SPINDLE TOOL ROTATING CHUCKING MACHINES,

available in three sizes, combine various turning, boring, facing, threading, multiple drilling and tapping operations on a wide range of single-ended parts.



The "ONE-TWO-THREE" 7-Spindle TOOL ROTATING CHUCKING MACHINE

can complete in one operation as many as three ends of valve bodies, plumbing fittings, etc. eliminating secondary operations.

REVOLUTION SES Cross IN LEGUSY BAE-THE-THREE

Send samples of your work for time estimates. Ask for illustrated literature.

GOSS and DE LEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Fellows Gear Shaper Co., Springfield, Vt. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Hartford Special Machry. Co., 287 Homestead Ave., Hartford, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee. Clark Controller Co., Cleveland, Ohio. General Electric Co., Schenectady 5, N. Y. General Radio Co., 275 Massachusetts Ave., Cambridge, Mass.

CONTROLS, Thermo

Control Products, Inc., 306 Sussex St., Harrison, N. J.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Link-Belt Co., 300 W. Pershing Rd., Chicago 9.

COOLANT SEPARATORS

See Separators, Oil or Coolant.

COUNTERBORES

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn. Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Lafrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Eclipse Counterbore Co., 1600 Bonner Ave.,
Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
St., 1242 E. 49th St.,
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit
32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester,
Mich.
Pratt & Whitney, West Hartford I., Conn. National Twist Drill & Tourist, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Starrett, The Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

COUNTERSINKS
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp. Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Super Tool Co., 21650 Hoover Rd., L Mich. Union Twist Drill Co., Athol, Mass.

(Continued on page 346)



What are your piercing or forming requirements—standard or unusual shapes—small or large holes—steel or special alloys—thin or thick metals? There is either an R-B punch in standard shapes and sizes or R-B will manufacture special punches, die buttons and retainers to your specifications that will provide more efficient piercing operations.

Many hole-making applications, formerly requiring drilling or some other costly means, can now be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment.

R-B Engineering Service Is Available for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION ALLIED PRODUCTS CORPORATION DEPT. 73 • 12619 BURT RD. • DETROIT 23, MICHIGAN Please send me additional information. NAME TITLE	Also Produced in OTHER ALLIED PLANTS SPECIAL COLD FORGED PARTS STANDARD CAP SCREWS
COMPANY	PRECISION GROUND PARTS
ADDRESS	SHEET METAL DIES MADE OF FERROUS ALLOYS,
CITYZONESTATE	ZINC ALLOYS OR PLASTICS



When all is said



6918 Thickness Gage



Wetproof Dial Indicator



205 Hole Location Gage



65P-40 Depth Gage



FOR ANYTHING IN MODERN GAGES



Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring,



Which gage manufacturer has consistently produced the most complete line of reliable modern gages of practical design and dependable accuracy?

Ever since Federal offered its first Dial Indicator, 37 years ago, this company has consistently lead the way in improvements, new instruments, and new methods of gaging. First to realize the value of Quality Control by Statistics, Federal was also first to promote its use by educating men all over the country in its application.

On the other hand, Federal has consistently weighed new ideas and rejected hundreds that would not stand up to requirements. After all, you can safely entrust your gaging problems to a concern that has such a background.

Moreover, Federal concentrates on the design and manufacture of dimensional gages - not only the wide variety of Indicator Gages shown here but also the most advanced type of Air Gages, Electric, and Electronic Gages - for continuous measuring, automatic sorting, and automatic dimensional control of parts produced on machine tools.

It's easy to investigate Federal Gages. Catalog 52 and our price list tell the whole story.

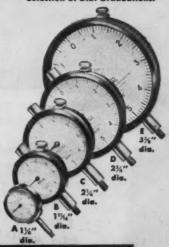
> FEDERAL PRODUCTS CORPORATION 41111 Eddy Street . Providence 1, R. I.



Adjustable 1.D.



Regular Dial Indicators Greatest Selection of Dial Graduations.



Sorting, or Automatically Controlling Dimensions on Machines



COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. J. Millers Falls Co., Greenfield, Mass. Starrett, The L. S., Co., Athol, Mass.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.

COUPLINGS, Flexible

COUPLINGS, Flexible
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171
E. McNichols Rd., Detroit 12, Mich.
Farrell-Birmingham Co., Inc., 25 Main St.,
Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave., and G St.,
Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.

COUPLINGS, Shaft

COUPLINGS, Shaft
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171
E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave.,
Philadelphia 40, Pa.
Sier-Bath & Pump Co., Inc., 9248 Hudson
Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio. Morgan Engrg. Co., Alliance, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg., Co., Providence, R. I. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
National Broach & Mch. Co., 5600 St., Jean
Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Tivis Drill & Tl. Co., Rochester, Mich.
Praft & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham,
Mass. Mass. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

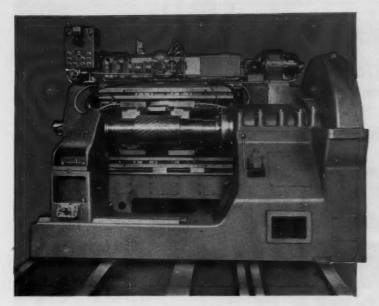
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Eelctric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd.,
Base Line, Mich. (Thread)
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit
32, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
(Continued on page 348)

(Continued on page 348)

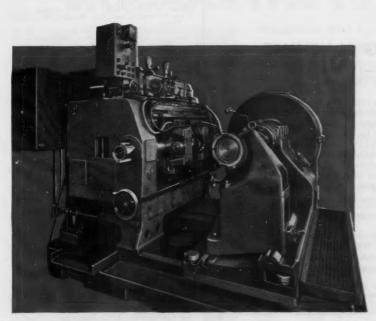


This front view shows start of cutting operation on continuous tooth herring-bone pinion with integral shaft. Controls are at upper left within easy reach of operating position.

The new Farrel-Sykes gear machine, the "Twin-Head" generator, cuts gears as much as 331/3% faster than preceding models, with higher accuracy and finish. This increased speed means fewer man and machine hours, with a resultant substantial decrease in manufacturing costs.

Setup time has also been reduced, and this, together with other conveniences afforded by new design features, contributes to more efficient operation. Rapid selection of speeds and feeds, easy adjustment of

How you can cut your gear manufacturing costs!



Side view, showing the twin cutting heads, left-hand helical guide, operating controls and work saddle.

cutters, easy and positive control of infeed, or depth of cut, are a few examples. On smaller gears the operator has merely to place the blank in position, press the starting button, and remove the gear after the teeth are cut.

Besides these advantages, the "Twin-Head" generator has exceptional versatility. It will cut all types of herringbone gears, single helical and spur gears, two members of a cluster gear simultaneously, and other toothed and cylindrical forms.

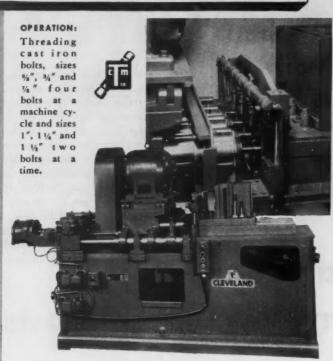
Write today for details of this new gear machine.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York,
Cambridge (Mass.), Akron, Cleveland,
Chicago, Los Angeles, Houston

Farrel-Birmingham

Another Cleveland Design to Speed Production!



CLEVELAND **BOLT THREADING MACHINE**

Produces 857-%"-11 Pitch Cast Iron Bolts per hour @ 100% Efficiency

DESCRIPTION: A Horizontal Four-Spindle Machine with magazine loaded feeders for automatically feeding and discharging cast iron bolts. On the rear of the base the drive unit and four-spindle head is mounted. The four-spindle head has four spindles mounted in a cast iron housing geared to drive together from a drive shaft on the rear of the housing. The spindle assembly mounted on heavy round hardened and ground ways to move forward and back at the back of the drive assembly housing the drive shaft extend through the rear to a split nut and lead screw assembly.

The four-spindle head is driven continuously by the drive motor, feed in by lead screw and split nut, rapid return by air.

On the front of the machine, an air-operated slide to take interchangeable jaws for taking bolts from the bottom of stack magazines and moving forward to threading position. The bolts are clamped into position by an upper clamp plate operated by an air cylinder through a toggle linkage.

Write today for Catalog No. MY-114

tapping machine co. A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC. . CANTON 6, OHIO



Ingersoll Milling Mch. Co., 2442 Dc.glas St., Rockford, III.
Rockford, III.
Rockford, III.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & TI. Co., Rochester, Mich. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago, III.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

cago 8, In.
Super Tool Co., 21650 Hoover Rd., Detroit
Mich.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Verner
Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burrs, Rotary

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Shear-Speed Chemical Products, Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich. Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan York. Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, III. Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, III. Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Pt. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I. Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Johnson Mfg. Co., Albion, Mich.
Landis Machine Co., Waynesboro, Pa., (Pipe). Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Allison Co., Bridgeport, Conn. Campbell Mch. Div., American Chain & Cable 929 Conn. Ave., Bridgeport, Conn. Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio. 1, Onio.
Delta Power Tool Div., Rockwell Mfg. Co.,
614 G. N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Sow

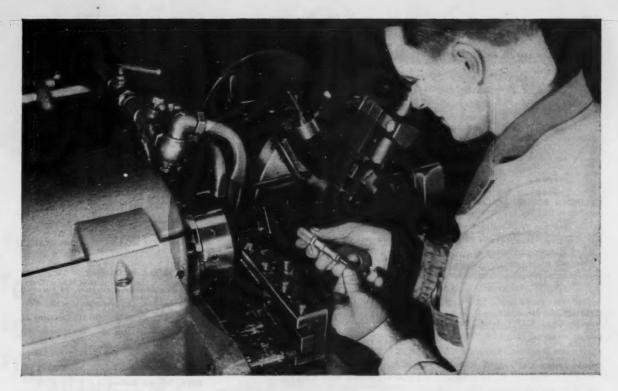
See Sewing Machines, Circular

CUTTING-OFF MACHINES. **Metal Band Saws**

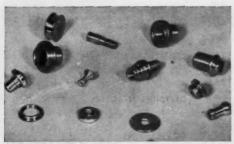
Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Grob, Inc., Grafton, Wis.

CUTTING-OFF TOOLS

CUTTING-OFF TOOLS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, III.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
(Continued on page 350)



TOOL LIFE INCREASED 40% USING CITIES SERVICE CUTTING OIL



ONE OIL FOR ALL? After poor results with many cutting oils, the Dunbar Machine & Tool Company discovered all their cutting jobs could be done to perfection using only one oil ... Cities Service Chillo #44.



NO EYE STRAIN. In addition to a 40% increase in tool life, owner Robert Dunbar found that the transparent characteristics of Chillo #44 help eliminate eye strain. Cutting operation is easily visible to operator.

Production Also Up, Reports Dunbar Machine & Tool Co.

THE PROBLEM... The Dunbar Machine & Tool Co., Massillon, Ohio, had a problem. It seemed impossible to find one oil which would perform economically and efficiently for ALL the jobs required of the firm's automatic screw machines.

THE SOLUTION... After trying many brands of cutting oil, "none of which gave good all-round performance," owner Robert Dunbar called in a Cities Service engineer. After careful analysis of the problem, the engineer recommended Chillo #44 cutting oil.

THE RESULTS... Using Chillo #44, the company observed these results: Tool life increased nearly 40%... Production increased accordingly... Additional savings realized due to chip draining characteristics of oil... Holding tolerances no longer any problem... Machine clean-up time now insignificant... Transparency of oil eliminates eye-strain... Less smoke and fumes at high speeds... Also excellent for lubricating purposes. Says Mr. Dunbar, "Our results with Chillo #44 permit us to heartily endorse this product."

If you have a cutting oil problem, consult your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5. N. Y.

CITIES A SERVICE

Kennametal, Inc., Latrobe, Pa. Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
7, N. Y.

CUTTING-OFF WHEELS, . Abrosive

Carborundum Co., Buffalo Ave., Niagara Falls. N. Y. Norton Co., 1 New Bond St., Worcester, Mass. Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa. Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Cross Co., 3250 Bellevue Ave., Datroit 7, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Ex-Cell-O Corp., 1200 Oakman Bidd., Defloit 32, Mich. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill. Moline Tool Co., 102 20th St., Moline, Ill. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

CYLINDERS. Air

Hannifin Corp., 501 Wolf Rd., Des Plaines, III.
Lehigh Foundries, Inc., 1500 Lehigh Dr.,
Easton, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, III. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hydraulic Press Mfg., Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr.,
Easton, Pa.
Logansport Machine Co. Inc., 810 Center Ave., Logansport, Ind. National Forge & Ordnance Co., Irvine, Warren County, Pa. Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis. Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee
51., Rockford, III.
Tomkins-Johnson Co., Jackson, Mich.

DEALERS, Machinery

Falk Machinery Co., 18 Ward St., Rochester, N. Y. N. Y. Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass. Heald Mch. Co., 10 New Bond St., Worcester 6, Mass. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Taft-Peirce Mfg. Co., Woonsocket, R. I. Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

DESIGNERS, Machine and Tool
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Hartford, Specialty Mchry. Co., 287 Homestead
St., Hartford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Praft & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.

DIAMONDS AND DIAMOND TOOLS

Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die

DIE-CASTING MACHINES

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio. Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.

DIE CUSHIONS

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Clearing Mch. Corp., 6499 W. 65th St., Chicago, III. cago, III.

Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, III.

DIE INSERTS, Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Po. Carboloy Dept., General Electric Co., Box 237, Rosevelt Park Annex, Detroit 32, Mich. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Kennametal Inc., Latrobe, Pa. Metal Carbides Corp., Young-trwn, Ohio. Willey's Carbide Tool, pp. 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

DIEMAKERS SUPPLIES
Bliss, E. W. Co., 1375 Reiff Rd., S. W. Canton,
Ohio.
Danly Mch. Specialties, Inc., 2107 5. 52nd
Ave., Chicago 50, III.
Producto Mch. Co., 990 Housatonic Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

DIEMAKING MACHINES

Grob, Inc., Grafton, Wis. Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y. Kearney & Trecker Corp., Milwaukee, Wis. Oliver Instrument Co., 1410 E. Moumee St., Adrian, Mich.

DIE SETS. Standard

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Ohio.

Danley Mch. Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.

Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

West Hartford 1. Conn. Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y. Pratt & Whitney, West Hartford 1, Conn. Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

DIE-SINKING MACHINES

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnoti, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St.
Racine, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia Balawin-Line-Teacher Corp., Milwaukee, Wis. Kearney & Trecker Corp., Milwaukee, Wis. Verson Allsteel Press Co., 93rd St., & S. Ken-wood Ave., Chicago, III.

DIE STOCKS

See Stocks, Die

DIES, Sheet Metal, Etc.

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio. Ohio.
Carboloy Dept. General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Chambersburg Engrg. Co., Chambersburg, Po. Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, III.
Ferracute Mch. Co., Bridgeton, N. J. Jahn B., Manufacturing Co., Ellis St., New Britain, Conn. Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks. 683 Northland
Ave., Buffalo, N. Y.
Richard Bross., Div., Allied Products Corp.,
12619 Burt Rd., Detroit 23, Mich.
Tetr-Pierce Mfg. Co., Woonsocket, R. I.
Verson Alisteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Waltham Mch. Wks., Newton St., Waltham,
Mass.

DIES, Threading

DIES, Threading
Butterfield Div., Union Twist Drill Co., Derby
Linz, Vt.
Card, S. W., Mfg., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd.,
Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New
Haven 15, Conn.,
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P. O. Box 350,
Worcester 1, Mass.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn. Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y. Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Ohio.

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Landis Mch. Co., Waynesboro, Pa. National Acme Co., 170 E. 131st St., Cleveland, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. Pratt & Whitney, West Hartford 1, Conn. Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

DISCS, Abrasives

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. N. Y.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts.,
Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.
Walls Sales Corp., 333 Nassau Ave. Brooklyn
22, N. Y.

DISINTEGRATORS

Elox Corp., 602 N. Rochester Rd., Clawson, Mich.

DIVIDING HEADS

See Indexing and Spacing Equipment

DOYELL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRESSERS, Grinding Wheel
Carboloy Dept., General Electric Co., Box 237
Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta.,
Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley
Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave.,
Bridegport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
Vinco Carp., 9113 Schaefer Hwy., Detroit 28,
Mich.
(Continued on page 352) (Continued on page 352)

PRATT & WHITNEY KELLERFLEX

SERIES "M" FLEXIBLE SHAFT MACHINES

FOR FAST,
LOW-COST
FINISHING

RUGGED... for constant, heavy-duty use. **VERSATILE...** 16 speeds (increased to 32 by high speed attachment) and a wide choice of attachments to handle an almost unlimited variety of jobs.

PRECISION BUILT... to insure smoother, more accurate performance and longer life, with substantially reduced maintenance costs.

POWERFUL ... ¼ to 1 hp ... all you need for any job.

FAST . . . speeds to 24,000 rpm . . . only machines with proved performance at speeds over 10,000 rpm, essential for fully efficient use of fast-cutting carbide burs.

ALL-PURPOSE MOUNT ... using the tray, the Series "M" Machine becomes a bench model; using the eye-bolt, it becomes a suspension type.

The leading manufacturer of flexible shaft machines for over twenty-five years, Pratt & Whitney is the oldest in the field. This long experience is reflected in the Kellerflex. Not only the machine... but also its attachments, handpieces and cables... are universally recognized as the finest ever produced. In hundreds of plants throughout the country Kellerflex Machines are helping the speed up production, reduce costs and improve quality... and they can do the same for yeu.

SEND NOW FOR

FULL INFORMATION
Write on your Company
letterhead for complete

information. Data on all attachments and accessories is included.

EASY SPEED CHANGES

... by depressing the spring-suspended jackshaft and shifting belts ... and by re-arranging the jackshaft sheaves ... no tools required.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U.S.A.

SINCE 186

First Choice (1) for Accuracy

BRANCH OFFICES ... BERMINGHAM . BOSTON . CHICAGO . CINCINNATI . CLEVELAND . DALLAS (The Stunce Co.) . DETROIT . HOUSTON (T

MACHINE TOOLS • CUTTING TOOLS • GAGES

DRIFTS, DRILL

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicogo, Ill. Chicogo-Latrobe Twist Drill Works, 411 W. Ontorio St., Chicogo, Ill. Whitmon. & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio. Barnes Drill Co., 814 Chestnut, Rockford, Ill. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Circinnati Lathe & Tool Co., Buhr Mich. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 6146 N. Lexington Ave., Pittsburgh & Pacerrington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I. N. Y.
Eto Tool Co., Inc., 592 Johnson Ave., Brooklyn, N., Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich., Govro-Nelson Co., Detroit & Mich., Mich. Golden, M. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, III.
Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, III.

Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.

Keller Tool Co., Grand Haven, Mich.

Kingsbury Mch. Tool Corp., Keene, N. H.

Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.

Morris Machine Tool Co., Inc., 946-H Harriet
St., Cincinnati 3, Ohio.

Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee
St., Rockford, III.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago Mich.
Proft & Whitney, West Harriord
Scully-Jones & Co., 1903 Rockwell St., Chicago
8, III.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Greenfield Tap & Die Corp., Greenfield, Mass. National Twist Drill & Tool Co., Rochester, Mich. Mich.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati 4, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILL STOPS

Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

DRILLING MACHINES, Automatic

DRILLING MACHINES, Automatic
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros. Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Consolidated Mch., Tool Corp., Rochester, N. Y.
Hortford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

Kingsbury Mch. Tool Corp., Keene, N. H.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., 946-M Harriet St.,
Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
20, Mich.
Zogar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

DRILLING MACHINES, Bench
Avey Drilling Mch. Co., 126 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Conedy-Otto Div., Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.,
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Leland-Gifford Co., 1025 Southbridge St.,
Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.,
Walker-Turner Div., Kearney & Treckar Corp.,
700 North Ave., Plainfield, N. J.

DRILLLING MACHINES, BOILER

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio. Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.

DRILLING MACHINES, Gang Avey Drilling Mch. Co., 26 E. Third St., Cov-

DRILLING MACHINES, Geng
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Boker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati Bickford Tool Co., Green Bay, Wis.
Clesereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland,
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St.,
Worcester Mass.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
20, Mich.

DRILLING MACHINES, Horiz, Duplex

DRILLING MACHINES, Horiz. Duplex
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, III.
Barnes W. F. & John Co., 201 S. Water St.,
Rockford, III. Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machiner Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Milholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, III.

Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati, Ohio.

DRILLING MACHINES, Inverted

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.

Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Avey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buhr, Mch. Tool Co., 835 Green St., Ann Arbor, Barnes Drill Co., 814 Chestnut, Rockford, III.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Boker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Brones, W. F. & John, Co., 201 S. Water St.
Rockford, Ill.
Boush Machiner Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. M. Co., 3743 Durango Ave.,
Los Angeles 34, Cal.
Canedy-Orto Div., Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Cincinnati, Ohio.
Cincinnati, Ohio.
Cleereman Mch. Tool Co., 3220 Forrer Ave.,
Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 2520 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.,
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia
Ave., Rockford, Ill.
Hartford Special Mchry, Co., 287 Homestead
St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St.,
Warcester, Mass.
Milholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrag. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Modern Ind. Engrag. Co., 162, 101.
Norris Machiner Tool Co., Inc., 5, 7th and
N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg Co., 435 Eostern Ave., Bellwood, Ill.
Snowth Bend Lathe Works, Inc., 425 E. Madison
St., Sauth Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(Continued on page 354) DRILLING MACHINES, Multiple Spindle

(Continued on page 354)

a "streamlined" buggy.



doesn't go very fast

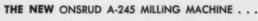


YOU NEED

- Onsrud high spindle speeds
- Onsrud fast fluid-feeds

TO REALIZE

- Finer surface finish
- Flat surfaces
- Higher production



FOR MODERN HIGH SPEED NON-FERROUS MILLING



Typical low cost set-up for manual profile milling operation using table guide-pin.

Here are some of the Onsrud design-features that result in better, faster production: High speed, high power Cutter Motor . . . direct drive, air cooled, two speed 3,600/7,200 RPM, $7\frac{1}{2}/15$ HP . . . provides recommended speed of 7,000 to 10,000 surface feet per minute for milling aluminum and related metals. Longitudinal and Transverse Fluid-Feeds with Onsrud-design, synchronized lever control at speeds from 0" to 150" per minute. Vertical Table Feed up to 10", in speed range from 0" to 50" per minute under power Fluid-Feed. Onsrud method of milling makes use of smaller diameter cutters, high rotational speed, and milling off of very small chips . . . to give extreme smooth finish. Table size 14"x 56" . . . flaps available for extra width.

Onsrud machines in your plant will save you hundreds or thousands of dollars per day . . . depending upon the amount of your production. For information about America's most challenging new production milling machine for nonferrous metals . . . write for the Onsrud A-245 Bulletin.

ONSRUD MACHINE WORKS, INC.

3940 Palmer Street

Chicago 47, Illinois

"JETWELDING"

Lincoln powdered iron electrodes introduce new savings in arc welding

HROUGH the use of powdered iron in the electrode coating, Lincoln "Jetweld" utilizes the heat of the arc more efficiently than conventional electrodes. The iron powder is deposited in the weld, permitting higher welding speeds . . . 35% and more, without sacrifice in strength or quality.

"Jetweld" electrodes have smooth, automatic-like appearance. They are self-cleaning to simplify fabrication and cut costly man-hours.

A drag-type electrode, "Jetweld" provides easy operation in flat and near flat position work. "Jetweld 1" (E-6012) is designed for fillet welds. "Jetweld 2" (E-6020) is for deep groove butt welds.



Figure 1. Crucible Action. End of "Jetweld" electrode forms a crucible. maintains right length of arc with simple drag technique.



Figure 2. X-Ray Quality. "Jetwelds" are self-cleaning. Appearance is smooth . . . resembles submerged-arc welds.

GET FACTS. Speeds and procedures for "Jetwelding" are in Lincoln Bulletin 462, Mild Steel Weldirectory. Write to

THE LINCOLN ELECTRIC COMPANY

Dept. 1207, Cleveland 17, Ohio THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

DRILLING MACHINES, Radial

DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston
Aves., Cincinnati, Ohio.

Canedy-Otto Div., Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.

Carlton Mch. Tool Co., 3000 Spring Grove Ave.,
Cincinnati 25, Ohio.

Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati, Ohio.

Cincinnati Bilbert Machine Tool Co., 3366
Beekman St., Cincinnati 23, Ohio.

Cosa Corp., 405 Lexington Ave., New York
17, N.Y.

Foot-Burt Co., 1300 St. Clair Ave., Cleveland,
Ohio. Foot-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Modern Ind. Engra, Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang

DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. N.Y. Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, N.Y. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Edlund Machinery Co., Cortland, N. Y. Foot-Burt Co., 1300 St. Clair Ave., Cleveland, Foot-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood III.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Upright

Avey Drilling Mch. Co., 26 E. Third St., Cov-Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y. N.Y. Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio. Cleereman Mch. Tool Co., Green Bay, Wis. Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N.Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Edlund Machinery Co., Cortland, N. Y. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio. Edlund Machinery Co., Cortland, N. Y. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, III.
Notional Automatic Tool Co., Inc., 25. 7th and N. Sts., Richmond, Ind.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, III.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood III.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works, 3817 St. Clair Ave., N.E., Cleveland, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS Center

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mask Keo Cutters, 19326 Woodward, Detroit, Mich. National Twist Drill & Tool Co., Rochester, Mich. Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Core

DRILLS, Core

Corboloy Dept., General Electric Co., Box 237
Roosevelt Park Annex, Detroit 32, Mich.
Chicogo-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave.,
Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh
30, Pa.,
Gairing Tool Co., 21225 Hoover Rd., Detroit
32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Hoynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.,
McGrosky Tool Corp., 1938 Thomas St., Meadville, Pa.,
Antonal Twist Drill & Tool Co., Rochester,
Mich.
Sully-Jones & Co., 1903 Rockwell St., Chi-Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, III.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
A'ch.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Pratt & Whitney, West Hartford 1, Conn. Smit, J. K., & Sons, Inc., Murray Hill, N. J. Union Twist Drill Co., Athol, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Portable Electric

Black & Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Ryerson Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, 18.

DRILLS, Portable Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St. New York 9, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLS, Rachet

DKILLS, Racher
Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, III.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich. Mich. Pratt & Whitney, West Hartford 1, Conn. Union Twist Drill Co., Athol, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist

DRILLS, Twist
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Prott & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Super Tool Co., 21000 From.
Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

[Continued on page 356)

FILTRATION for AUTOMATION

Delpark

MAKES AN ASSIST

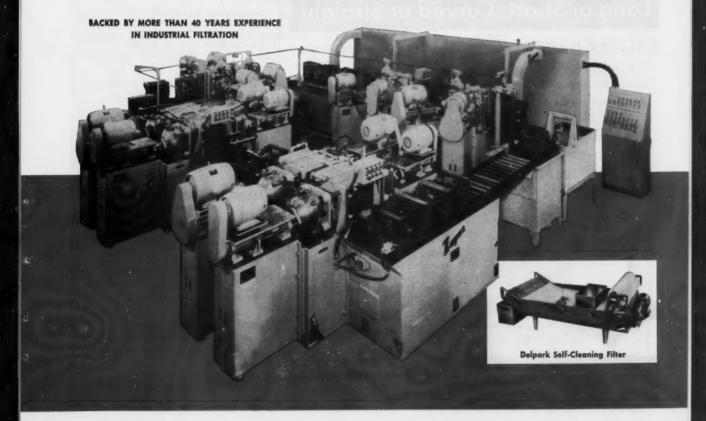
Quality Control .

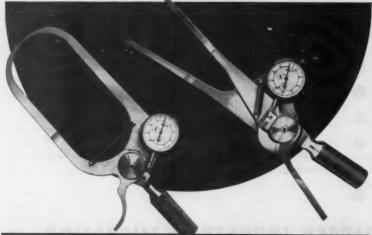
These Zagar pallet-type transfer machines at IBM perform numerous drilling operations on aluminum frames for the famous IBM typewriters.

Here is a fine example of Automation . . . and backing up this unit is automation in filtration. You won't see it in the picture, but . . . Delpark filtration cleans coolant from the 206 drill spindles. Greater accuracy of drill hole size, longer drill life, more efficient tool operation are but a few of the major savings gained through Delpark filtration. Delpark is one reason why up to 144 parts per hour are handled on this unit with but two operators. Credit IBM and Zagar tool engineering for foresight . . . credit IBM tool service for production know-how . . . credit Delpark for filtration as modern as today's automation.

For your filtration problems . . . for automation or normal procedure . . . contact Delpark for competent field engineering. There's no obligation. Write today.

DELPARK INDUSTRIAL FILTRATION





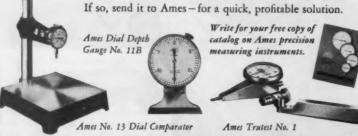
Long or Short: Curved or Straight

CALIPER GAUGES. Custom-built to fit your exact need

Whatever your measuring problem - whether it's the inside dimensions of a pipe, the wall thickness of a casting, the outside dimensions of a rocket -Ames can build the caliper gauge that fills your requirements.

Ames caliper gauges are made of carefully-finished heavy gauge steel and are equipped with an Ames exclusive: a chordal error correcting cam that assures accurate readings. Ames calipers are available with contacts of various shapes - ball, flat or pointed - made of carbide, hardened steel, or sapphire.

Your measuring problems may involve a caliper gauge.



C. AMES CO. Waltham 54, Main

DRILLS, Wire

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III. Greenfield Tap & Die Corp., Greenfield, Mass. National Twist Drill & Tool Co., Rochester, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRIVES, Chain

Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind.

DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Richford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, III.

DUST COLLECTORS

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS

Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady 5, N. Y.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel

EMERY WHEELS

See Grinding Wheels

ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N.Y. Gorton Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Drill

Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

EXTRACTORS, Screw

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Greenfield Tap & Die Corp., Greenfield, Mass. Union Twist Drill Co., Athol, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

FACING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. N. Y. General Electric Co., Schenectady 5, N. Y.

A

FEEDS FOR PRESSES, Automatic

Federal Press Co., 600 Division and Big Four R. R. Elkhart, Ind. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

FELT, For All Applications

American Felt Co., Glenville, Conn. (Continued on page 358)

Specialists in AUTOMATIC MACHINES

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

Since 1919

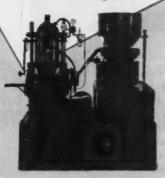
Swanson offers a fully integrated organization experienced in engineering and building special automatic machines for machining, processing and assembling small and medium parts. Illustrated are typical examples of Swanson special machines which are improving quality and lowering costs in a wide range of manufacturing operations. Because they incorporate Swanson-developed standard components wherever applicable, both time and money were saved in their completion.

If you have a problem in automation, tell us about it. We'd like to help.

Completely automatic turrentype machine for processing four electronic parts simultaneously at each index. Equipped with hopper feed, automatic chucking, transfer mechanism, Swanson-designed memory device and

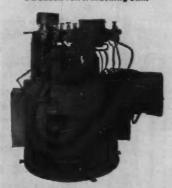


Your inquiries will be treated in full confidence...our recommendations submitted without obligation.



An automatic straight-line indexing machine, designed for injecting cement into flash bulb bases. Machines of this type have increased previous production rates by three to five times.

This special machine for drifting, tapping, reaming and counterbering cigarette lightor parts at 1200 per hour, was designed and built arround a standard 8-station Swanson Turrel Indexing Unit.



SWANSON TOOL & MACHINE PRODUCTS, INC.

814 East 8th Street . Erie, Pa. . Phone 2-6763

FILES, Hack

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.

FILES, Hand

Atkins Saw Div., Borg-Warner Corp., 402 S.
Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence,
R. Simonds Saw & Steal Co. 470 Mais S. Filab Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.

FILES, Machine

Atkins Saw Div., Borg-Warner Corp., 402 S.
Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.

FILES AND BURS, Rotary

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Pratt & Whitney, West Hartford 1, Conn. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Germanow Simon Mch. Co., 388 St. Paul St., Rochester, N. Y.

Grob, Inc., Grafton, Wis. Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Air

Keller Tool Co., Grand Haven, Mich.

FILTERS, Coolant and Oil

Barnes Drill Co., 814 Chestnut St., Rockford, Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind.

FINISHES FOR MACHINES AND METAL PARTS

Lowe Bros. Co., Dayton, Ohio. Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis, Ind.

FLEXIBLE COUPLINGS

See Couplings, Flexible

FLEXIBLE SHAFT EQUIPMENT

Pratt & Whitney West Hartford 1, Conn. Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

FORGINGS, (Upsetting) Machines

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Ohio.

Ohio.

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

FORGINGS, Drop

Bethlehem Steel Co., Bethlehem, Pa. Mueller Brass Co., Port Huron 35, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa. National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa. Cameron Iron Works, Inc., 1000 Silber Rd., Houston, Texas. Morgan Engrg. Co., Alliance, Ohio. National Forge & Ordnance Co., Irvine, Warren County, Pa.

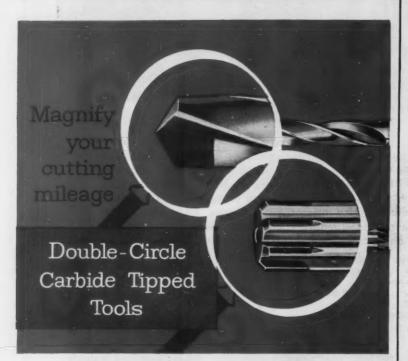
FORGINGS, Upset

Bethlehem Steel Co., Bethlehem, Pa. Mueller Brass Co., Port Huron 35, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORMING AND BENDING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincin-Paddock Kd., and Tennessee Ave., Cincinnati, Ohio. Handmilton Corp., Eddystone Div., Philadelphia 42, Pa. Bethlehem Steel Co., Bethlehem Pa. Chambersburg Engra. Co., Chambersburg, Pa. Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y. Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill. nati. Ohio.

HII.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Niogara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Yoder Co., 5500 Walworth, Cleveland, Ohio.
(Continued on page 360)





An enlarged view of Double-Circle carbide inserts can only give you a minor part of the story of their cutting magic. These splendid tools have a "beneath-the-surface" story that is the true key to their superiority. In a word, this is the vast experience of Chicago-Latrobe in cutting tool engineering, in selection and testing of materials and in precision manufacturing methods. It is not surprising that wise buyers everywhere look to Chicago-Latrobe's complete line for the tools that make cutting operations faster, smoother, easier. For greater cutting mileage, always specify Double-Circle carbide tipped drills and reamers.

YOU'LL GET -QUICK SERVICE-

FROM A CHICAGO-LATROBE DISTRIBUTOR



CHICAGO-LATROBE

DRILLS . REAMERS . COUNTERSINKS . COUNTERBORES . CARBIDE TOOLS . SPECIAL TOOLS

4,800

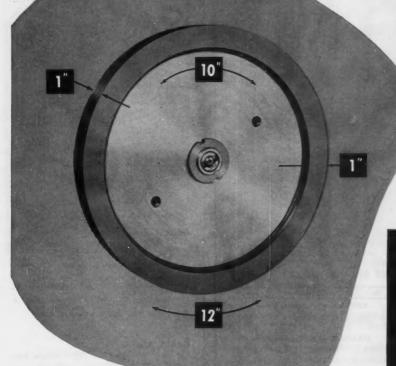
 $\frac{1}{2}$ x $\frac{1}{2}$ tungsten carbide

insert tools with this \$45

brass wheel and

increase tool life

50 to 200%



Day per tool shorpened:

.009

Convert from abrasive and diamond wheels to an Elox brass wheel and save 50

minutes sharpening 20

carbide insert tools.

WE CAN SHOW YOU HOW! OX corporation of michigan

clawson, michigan

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-359

FORMING AND STAMPING MACHINES

Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn.

ford, Conn.
Chambersburg, Engrg, Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd.,
Chicago 36, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FORMING TOOLS or Tool Blanks

Brown & Sharpe Mfg. Co., Providence, R. I. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

FRAMES, Machinery Welded

Mahan, R. H. Co., Detroit 34, Mich. Verson Allsteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, III.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I. Dearborn Gage Co., 22038 Beech St., Dearborn,

Dearborn Gage Co., 22038 Beech St., Dearborn, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, II.
Pratt & Whitney, West Hartford 1, Con. II.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Tatt-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown,
Boston, Mass.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford I, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator

GAGES, Comparator

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.

Ames, B. C., Co., Waltham 54, Mass.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.

Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.

DoAll Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P. O. Box 1027, Providence, R. I.

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

GAGES, Depth

Ames, B. C., Co., (Dial), Waltham 54, Mass.

Brown & Sharpe Mrg. Co., Providence, R. I.

Dearborn Gage Co., 22038 Beech St., Dearborn,

Mich.,

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.

Federal Products Corp., P. O. Box 1027, Providence, R. I.

Hanson-Whitney Co., Div., Whitney Chain Co.,

Hartford, Conn.

Lufkin Rule Co., Hess Ave., Saginaw, Mich.

Millers Falls Co., Greenfield, Mass.

Scherr, George Co., Inc., 200 Lafayette St.,

New York 12, N. Y.

Standard Gage Co., Inc., Poughkeepsie, N. Y.

Standard Gage Co., Inc., Poughkeepsie, N. Y.

Starrett, The L. S., Co., Athøl, Mass.

Taft-Peirce Mrg. Co., Woonsocket, R. I.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co. Inc., 200 Lafayette St.,
New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio. Cosa Corp., 405 Lexington Ave., New York 17. DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Federal Products Corp., P. O. Box 1027 Providence, R. I. Pratt & Whitney, West Hartford 1, Conn.

GAGES, Height

GAGES, Height
Amco Gage Co., 19760 W. 8 Mile Rd. Detroit
19, Mich.
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave.,
Cleveland 15, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Prott & Whitney, West Hartford I, Conn.
Scherr, George Co., Inc., 200 Larayette St.,
New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

(Continued on page 362)

Nothing to get out of order... accurate every time



• Never a doubt about the accuracy of these new Torque MEASURRENCHES®. No worry about hard use, even abuse, that upsets delicate dials, gears and levers. When you sight-read Williams patented time-proved converging scale . . . you can depend upon what you see.

These precision machined wrenches are made of heat-treated, selected alloy steels. They give years of trouble-free service. Experienced design combines proportional balance and light weight to accent "feel". Finish is in chrome with calibrated areas buffed. Ask for folder A-460.

Looking for a superior reversible ratchet model? Ask your distributor for Williams S-57. Both sight and sound readings in one.



B-58A B-58 S-58A 5-58 LIST PRICE \$10 \$12 \$15

No. Length Capacity BANTAM — %" Square Drive B-58A 0 to 150 in. lbs. 121/4"

0 to 600 in. lbs. 151/2 STANDARD - 1/2" Square Drive 18" S-58A 0 to 100 ft. lbs. S-58 0 to 200 ft. lbs 197/8"

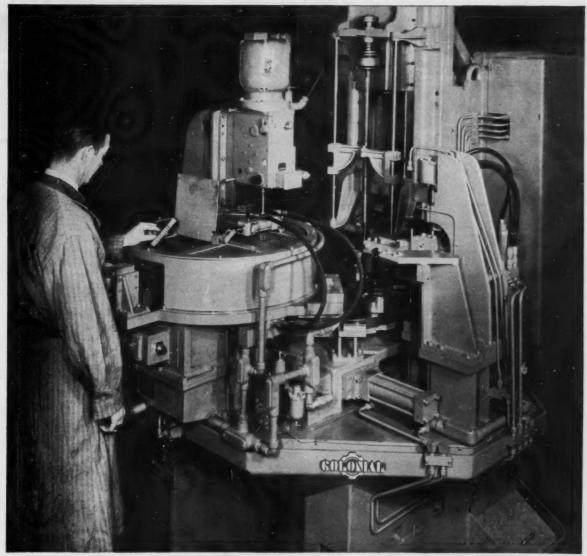
B-58

· Available individually boxed or as a complete set T4-58 in metal case. List price \$60



PLUS local service from a Williams Distributor. J. H. WILLIAMS & CO. 407 Vulcan Street





BROACHING-"PLUS"

200 finished pieces per hour

This Colonial 6-ton 24-inch stroke pull-down machine, broaches, drills and stamps more than 200 camshaft sprockets per hour. Cycle is completely automatic as follows: 1) drill .2656" hole in web, 2) broach .1895" keyway in bore, 3) stamp timing mark on sprocket, 4) eject completed parts onto a conveyor. Operator merely keeps loading magazines filled with parts.

Broaching-"Plus" is a new trend in broaching machines today. Integrating broaching into a machining sequence on a part, so that the operator has less work handling, cuts costs and speeds up processing.

Colonial Broaching-"Plus" machines can perform multiple operations on your parts. For information on how your costs can be cut, send your prints and production requirements to Colonial Broach Company's Engineering Department.

UNIFIED BROACHING is the key to successful broaching



GAGES, Plug, Ring and Snap

GAGES, Plug, Ring and Snap
Amco Gage Co., 19760 W. 8 Mile Rd., Detroit
19, Mich.
Axelson Mfg. Co., P. O. Box 15335, Vernon
Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Dearborn Gage Co., 22038 Beech St., Dearborn,
Mich.
DoAlf Co., 254 Laurel Ave., Des Plainss, III.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Greenfield Top & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Scherr, George, Co., Inc., 200 Lafayette St.,
Prott & Whitney, West Hartford I, Conn.

Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co. Athol Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I. Turner Bros. Inc., 2625 Hillon Rd., Ferndale 20, Mich.

20, Mich. Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass. Vinco Corp., 9113 Schaefer Hwy., Detrait 28, Mich.

Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GAGES, Surface

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich.

19, Mich.
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland
Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Hanson-Whitney Co., Div. Whitney Chain Co.,
Hartford, Conn.

Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Fails Co., Greenfield, Mass. Starrett, The L. S., Co., Athol, Mass.

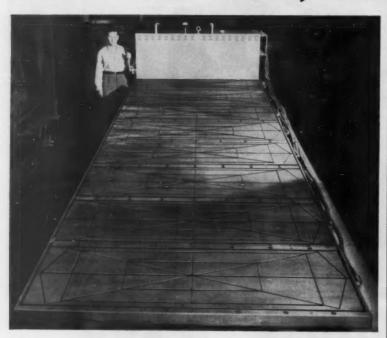
GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., 22038 Beech St., Dearborn,
Mich.
Pratt & Whitney, West Hartford 1, Conn.
Storrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Acelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif. Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Federal Products Corp., P. O. Box 1027, Providence, R. I. Greenfield Tap & Die Corp., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Taft-Peirce Mfg. Co., Woonsocket, R. I.

Walker Does It Again-



Walker, pioneer in the chuck industry, has been utilizing magnetic force to make all types of special and standard chucks since 1887.

Walker now harnesses atmospheric force for special vacuum chucks to hold non-magnetic materials. First a leader in magnetic force—now a pioneer in atmospheric force.

Hold Everything with Walker Chucks

O. S. WALKER CO.Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

Crane Packing Co., 1800 Cuyler Ave., Chicago. Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y. General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Gleason Works, 1000 University Ave., Roches-ter 3, N. Y.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa. Consolidated Mch. Tool Corp., Rochester, N. Y. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Lipe-Rollway Corp., 806 Emerson Ave., Syra-cuse, N. Y. Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich. Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.

Eastman Kodak Co., Rochester, N. Y.

Fellows Gear Shaper Co., 78 River St., Springfield, Vf.

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.

National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.

Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Vinco Corp., 9113 Schaefer Highway, Detroit
28, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa. Gleason Works, 1000 University Ave., Roches-ter 3, N. Y. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

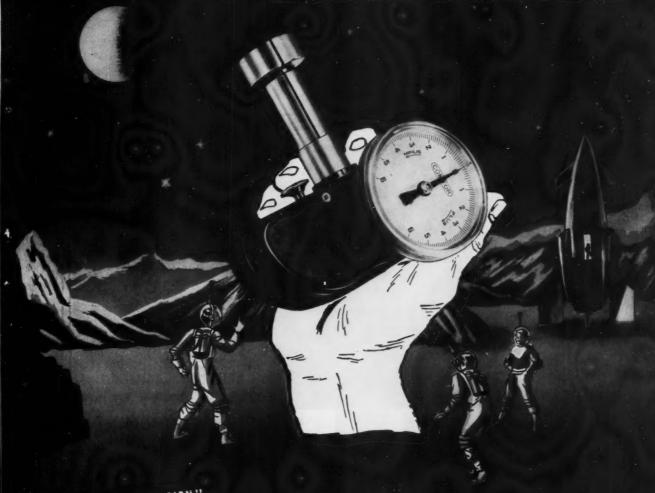
GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter) Scherr, George Co., Inc., 200 Lafayette St., New York 12, N.: Waltham Machine Works, Newton St., Wal-tham Mass.

(Continued on page 364)

Each year more and more firms are discovering COMTORPLUG



"PACKAGED PRECISION"

NEEDS NO WIRES, HOSE, ELECTRONIC GEAR OR HEAVY BASE

REQUEST NEW BULLETIN NO. 48

COMTOR CO. 74 FARWELL ST., WALTHAM S4, MASS



Barwood & Company Rerald S. Duff & Company F. D. Hentington Co. 3:37 North 15th Street & Clinton Avenue 3101 East Jeffson & Philadelphia 22 Pa. Mayard S. New Japan Berford M. Bitchiana

13.37 North 15th Sirvet & Ginten Avenue 51nt East Jolaruse Avenue Philadelphia 22, Pt. Nevarts, New Jorge Dotroit (4, Richigan Societier Company Louis A. Gain Tulas Tariftery M. L. Levis

th Section Company Louis A. Vain

Dulman Blyd.

1504 Spruce Street L. O. Swady Co.
Levis 5. Misseuri Sorkoley, California 436 Magie Street
Wichita, Kansaa

Tulsa Territory M. L. Levis L. O. Sugary Co. Farryley Park 436 Magie Street 4594 West 214th Michile Rances Cleveland 28 Ob 207 Franklin Street Botton, Moss.

ter R. Olt Severance Tools of Canada, Ltd. Ahingdon Road 1232 Egilinton Avenue Wast Torsedo, Onfario

onda, Lid. Gerbart M. Casha West 4760 East Olympic Stud Los Angeles 22, Colliers

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rock-ford, III. ford, III.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and

Helical Gears (Shaper or Planer Type)
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Tool Co., 11200 Madison Ave., Cleve-land, Ohio.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, III.

Cone-Drive Gear Div., Michigan Tool Co., 7171

E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).

Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hillside, N. J.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Gleason Works, 1000 University Ave., Roches-ter 3, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Notional Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES

GEAR GRINDING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher
St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jecn Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
Notional Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

GEARS. Cut

GEARS, Cut

Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring
Garden St., Philadelphio, P.a.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave.,
Cicicero So, Ill.
Braun Geor Co., 239 Richmond, Brooklyn 8,
N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland Worm & Gear Co., Betrolen Ave.,
Y-200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave.,
Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave.,
Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez
Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.

(Continued on page 368)

(Continued on page 368)



Directly Produces Quality Control Charts!

Here, a recorder is used with a Cleveland Par-Ac electronic production gage to make quality control charts for precision machining operations. The gage head is set with a master; and sample parts, taken from the machines at fixed intervals, are quickly checked as shown. The recorder chart shows deviations from nominal size—thus directly provides the data needed for statistical quality control.

Recorders are also used with our Indi-Ac electronic indicator and Micro-Ac electronic microcomparator-to provide chart records of runout, taper, eccentricity, deviations in dimensions, and similar measurements.

FREE BULLETIN 542 shows shop, tool room and gage room applications of this and many other kinds . . . describes the equipment, both standard and special . . and explains advantages offered only by Cleveland gaging equipment. May we send you a copy?

*BEST? Ask the USERS. Names on request.

Designed, developed and manufactured by

INSTRUMENT CO CLEVELAND 15, OHIO 735-2 CARNEGIE AVE.

ANY WAY YOU LOOK AT IT ...

from PRECISION GRINDING to ROUGH SNAGGING

SIMONDS ABRASIVE CO.

Grinding Wheels
give superior results

Accuracy of finish—or top tonnage ground! Just name your grinding need. There's a Simonds Wheel exactly right for the job. Right in grain and grade. Correct in shape and size. Dependable in action and economical in wheel wear.

Write for free data book and name of your Simonds distributor.





SIMONDS
ABRASIVE CO



SIMONDS ABRASIVE COMPANY PHILADELPHIA 37, PA.

BRANCH WAREHOUSES: Boston, Detroit, Chicago, Portland, San Francisco
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. OTHER SIMONDS COMPANIES: Simonds Steel Mills, Lockport, N.Y., Simonds Canada Saw Co., Ltd., Montreal, Quebec and Simonds Canada Abrasive Co., Ltd., Arvida, Quebec

however you figure it... Gilberts pay off!

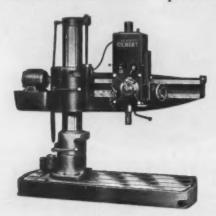
Whatever your yardsticks—sustained accuracy, operator convenience, long life, work per hour, or earning power per square foot of floor space—you'll find Cincinnati Gilbert's advanced construction features provide long range paying investments. On your next purchase of radials or horizontal boring mills check with your nearby Cincinnati Gilbert representative.

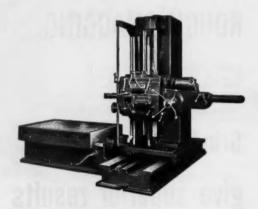
Horizontal Boring Mill: Compound rectangular table type. Head travel: 36" to 72". Bed: 84" to 120". Spindle diameter: 3½" or 3¾". Write for Bulletin 953. Compound built-in rotary table types also furnished in comparable sizes: Bulletin 348.





Rotary Table: (left) Worm driven with power rapid revolving. Hand adjustment made with dial on worm shaft reading in minutes. Dial type indexing, 36" and 50" square or round, Bulletin 854. Universal Table: (right) Five sides of a cube can be machined at one setting of work piece, Sizes: 22" x 22" and 27" x 27" top. Bulletin 850.

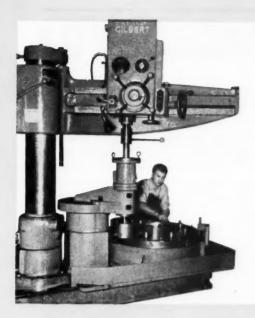




Horizontal Boring Mill: Floor type. Head travel: 36" to 96". Column traverse: 36" to 168": Spindle diameters: 3½" or 3¾". Can be equipped with floor plates; boring bar supports; stationary, sliding, or built-in rotary tables; revolving columns, and special arrangements. Write for Bulletin 954.

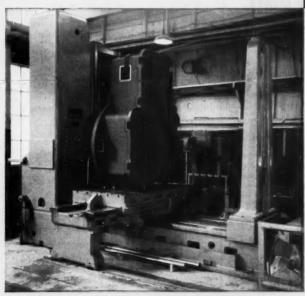
Radial Drilling Machine: 9" and 11" columns. Centralized, "comfort level" controls. 12 speeds, 6 feeds. Twelve basic features make these the most modern radials you can buy. Write for Bulletin 349.

GILBERT
MACHINE TO DL COMPANY
3388 BEEKMAN STREET - CINCINNATI 23, 0010



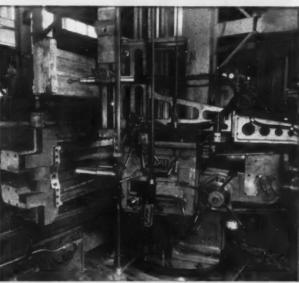
RIGHT: "The Gilbert revolving column boring mills, together with the very accurate Goodrich follower, make possible the machining of deep cavity, steep side dies complete in one position of the work piece," says Mr. Ed Miller, president of the Lansing Tool & Die Co. "It is also possible to machine cupped ends or reverse curves without having to move the job." Such work can be done only on a Gilbert.

BELOW: Gilbert table type boring mill, showing extended saddle with outboard supports. This provides extreme rigidity when working with pieces of unusual size or shape.



they specified Gilbert... and earned from the start

LEFT: Ryan Aeronautical Co. cut machining time from two days to two hours and halved their initial investment when they used Gilbert radials to machine stainless steel aft frames for jet engines. Specifications demanded tolerances of .005" and finishes of 63 RMS.



WRITE FOR LITERATURE: Nineteen more case stories are documented in Bulletin 1049. Descriptions and specifications on other Gilbert equipment are available in several new bulletins. Write for copies, or call your Gilbert representative.

GILBERT

MACHINE TO DL COMPANY

3380 BEEKNAN STREET • CINCINNATI 23, 0810

Micron Gear Mfg. Co., 102-38 Corona Ave., Corona, N. Y.
Notional Broach & Mch. Co., 5600 St. Jean Ave., Detroit 13, Mich.
New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Perkins Machine & Gear Co., West Springfield, Mass.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson

Pittsburgh Seed Co., New York, 125, Pa.
25, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

Boston Gear Works, 3200 Main St., North Quincy, Mass.

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Dittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y. Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.

Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129
Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan. N. Y. Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, III. Sun Oil Co., 1608 Walnut St., Philadelphia. Texas Co., 135 E. 42nd St., New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Conn. Madison-Kipp Corp., Madison, Wis. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York, N. Y.
Millers Falls Co., Greenfield, Mass.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

GRINDING FIXTURES

Amco Gage Co., 19760 W. 8 Mile Rd., Detroit 19, Mich. Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn. Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, III.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Gorton, George, Mch. Co., 1110 W. 13th St., Hardinge Bros., Inc., 1418 College Ave., El-mira, N. Y. Hardinge Bros., Inc., 1418 College Ave., El-mira, N. Y. Millers Falls Co., Greenfield, Mass. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio. Walker-Turner Div. Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

(Continued on page 370)



MILLHOLLAND **ENGINEERED** FOR MAXIMUM PRODUCTION

For special production machines, Millholland Automatic Units offer distinct advantages. These self-contained units,

adapted to a wide range of operations. Their full automatic cycle with interlocked controls permits several units to be grouped for simultaneous operations, or they can be mounted on other production machines and synchronized to perform additional operations. Millholland Automatic Units have proved themselves in 30 years of outstanding performance on all types of jobs. Get full details in Bulletin M-11.

W. K. MILLHOLLAND MACHINERY CO.

6402 Westfield Blvd., Indianapolis 2, Indiana

hole. Station 3—Combination spot face and chamfer (3) holes, drill (1) 23/32" hole for tapping. Station 4—Tap (3) 7/16"-14 NC-3 thread; tap 1/2"-14

Description: Millholland 4-station automatic index machine equipped with 4station automatic index table, with 1 No.

5 Millholland Automatic Unit driven by

7-1/2 HP motor with 8-spindle ball bearing multiple head for drilling 5 holes and

combination spot facing and chamfering 3 holes; 4-spindle tapper on right-hand

Operator loads part and pushes button

initiating automatic cycle, unloads. Two

parts machined at a time.

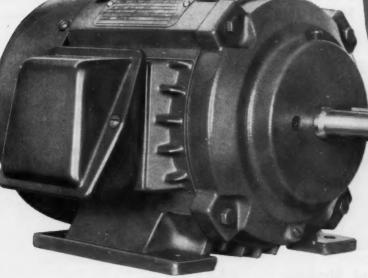
NPSF thread.

column.

FOR RUGGED SERVICE...

"All motors are NOT alike!"





Reliance Totally-enclosed Fan-cooled A-c Motor. All other standard enclosures available, with wide choice of mechanical and electrical designs and special mountings. Ratings from 3/4 to 300 bp.

- Heavy shafts, bearing to bearing
- Indestructible pressure-cast rotors
- Shock-resistant frame and bearing-bracket construction



... AND THE BEST PRE-LUBRICATED BEARING DESIGN

The Reliance pre-lubricated bearing provides four times more operating bours without re-lubrication than any other bearing used in motors today. And—whatever your lubrication schedule—you just can't grease'em wrong! To get the complete "inside story" on motor bearings, write today for new Bulletin B-2202. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. 19-1466V

RELIANCE ELECTRIC AND ..

1077 Isunhoe Road, Cleveland 10, Ohlo . Sales Representatives in Principal Cities

GRINDING MACHINES, Broach

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich. Lapointe Mch. Tool Co., 34 Tower St., Hudson, Musss.

GRINDING MACHINES, Comshaft

Landis Tool Co., Waynesboro, Pa. Norton Co., I New Bond St., Worcester 6,

GRINDING MACHINES, Carbide Tool
Arter Grinding Mch. Co., 15 Sagamore Rd.,
Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Po. DoAll Co., 254 N. Laurel Ave., Des Plaines,

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

32, Mich.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio. Heald Machine Co., 10 New Bond St., Worcester 6, Mass. Landis Tool Co., Waynesboro, Pa. Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking

Baird Machines Co., 1700 Stratford Ave., Stratford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St.,
Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6,

GRINDING MACHINES, Cylindrical

GRINDING MACHINES, Cylindrical
Arter Grinding Mch. Co., 15 Sagamore Rd.,
Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York
17, N. Y.
Frauenthal Div., Kaydon Engineering Corp.,
Muskegon, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6,
Mass.
Rivett Lathe & Grinder Inc., Bighton, Boston
35, Mass.
Van Norman Co., 2640 Main St., Springfield
7, Mass.

GRINDER MACHINES, Die Choser

Eastern Mch. Screw Corp., New Haven, Conn Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Mattison Machine Works, Rockford, III.

GRINDING MACHINES, Drill

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich. Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. Lehigh Foundries, Inc., 1500 Lenigh Sh., Easton, Pa. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y. Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Cosa Corp., 405 Levisator, Ave. New York Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Machine Works, Rockford, III.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.

GRINDING MACHINES, Flexible Shaft See Flexible Shaft Equipment

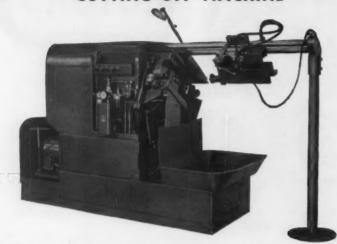
GRINDING MACHINES, Gop Cincinnati Grinders, Inc., Cincinnati, Ohio. Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth See Gear Grinding Machines

GRINDING MACHINES For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rock-ford, III. Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Mch. Co., Cincinnati, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. elta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. (Continued on page 372)

The NEW MODERN AUTOMATIC CUTTING-OFF MACHINE



Cuts Off Tubing, Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off any length you want-and cuts it faster. If your production requires quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

1/2" Tubing This machine cuts off and

chamfers both outside edges of ½" .030 wall tubing, 5" long, at the rate of one every 2.5 seconds.

1 1/4" Cold Rolled

This machine cuts off and chamfers both ends of 11/4" cold rolled, 20" long, at the rate of one every 20 seconds.

1" Tubing

This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every seconds.

These popular, time saving machines are now available in four sizes, handling work up to 63/4" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

4" Threaded Studs

Cut and chamfered at one time—in 8 seconds— from 10 ft. length of stock already threaded. (3/4" U. S. Standard.) Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

WRITE FOR ILLUSTRATED CATALOG.

MODERN MACHINE TOOL CO. Jackson, Michigan

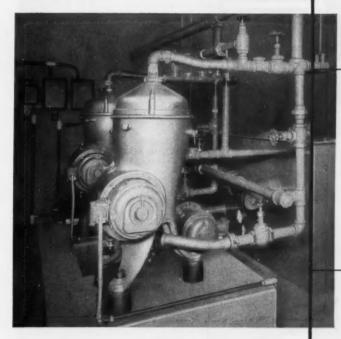
There are eighteen distinct metal working plant uses for De Laval Centrifugals—and every one is either a time-saver, a money-saver, a product improver... or all three!

So the odds are all in your favor. There are probably several places in your plant where a De Laval will more than earn its cost .. by making sure that the oils you use will be both clean and dry.

Look over the applications listed below. Check those of special interest to you. Then ask De Laval for complete information... today!

THE ODDS ARE EIGHTEEN TO ONE...

in your favor!



CHECK THIS LIST

Motor Block Testing Oil
Baler Oil . . . Boring Oil . . . Cable Oil
Briquetting Oil . . . Cutting Oil . . . Drawing Oil
Grinding Coolant . . . Engine Oil
Honing Oil . . . Hydraulic Oil . . . Recoil Oil
Lubricating Oil . . . Shock Absorber Oil
Quenching Oil . . . Slushing Oil
Transmission Oil . . . Washing Oil



DE LAVAL

purifiers and clarifiers for factory oils

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York + 427 Randolph St., Chicago 6 - DE LAVAL PACIFIC CO. 61 Beale St., San Francisco 5

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-371

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave.,
S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Clincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6,
Mass.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.
Prott & Whitney, West Hartford 1, Conn.
Thompson Grinder Co., 1500 W. Main St.,

Springfield, Ohio.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 6146 N. Lexington Ave., Pittsburgh 8, Pa. DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Provi-dence 14, R. I. Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt. Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, N. I. Corp., Corp. 1300, October Blad. Detroit N.Y.
Ex-Cell-Q Corp., 1200 Oakman Blvd., Detroit,
32 Mich.
Frouenthal Div., Kaydon Engineering Corp.,
Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N.Y.
Rivett Lathe & Grinder Inc., Brighton, Boston
35, Mass.

GRINDING MACHINES, Jig

Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y. Moore Special Tool Co. Inc., 724 Union Ave. Bridgeport, Con., Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,

Ohio. Mattison Machine Works, Rockford, III. United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati

Elec. Mf

4

GRINDING MACHINES, Piston Ring

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Heald Machine Co., 10 New Bond St., Worces-ter 6, Mass.

Mattison Machine Works, Rockford, Ill. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich. Landis Tool Co., Waynesboro, Pa. Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Radial

Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

GRINDING MACHINES, Radius, Link

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn. Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Van Norman Co., Springfield, Mass. (Continued on page 374)

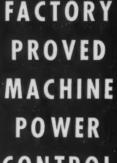






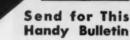












Shows typical installations of ROCKFORD



CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes

capacity tables, dimensions and complete specifications.



ROCKFORD CLUTCHES and

ROCKFORD CLUTCH DIVISION

BORG-WARNER 410 Catherine Street, Rockford, Illinois

ROCKFOR .UTCH

DRILL-SPOT FACE-COUNTERSINK-REAM-TAP



GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd.,
Worcester 5, Mass. (Rotary)
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbia Div., Lodge & Shipley Co., Hamilton
1, Ohio.
Delfa Power Tool Div., Rockwell Mfg. Co.,

Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
2, Ohio.
2,

Mattison Machine Works, Rockford, III. Norton Co., 1 New Bond St., Worcester 6, Mattison Machine Works, Rockford, III.
Norton Co., 1 New Bond St., Worcester 6,
Mass.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Standard Electrical Tool Co., 2488-90 River
Rd., Clincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St.,
Springfield, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Top

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

GRINDING MACHINES, Thread

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y. Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Landis Machine Co. (Centerless), Waynesboro, Pon, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich. Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y. Landis Tool Co., Waynesboro, Pa. Norton Co., I New Bond St., Worcester 6, Mass. Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

GRINDING WHEELS
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Gardner Machine Co. (Surface Grinder), 414 E.
Gardner St., Beloit, Wis.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts.,
Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.

GROOVE PINS

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, III.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Morgan Engrg Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa. Lobdell United Co., 200 "G" St., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md. Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa. Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

Standard Pressed Steel Co., Jenkintown, Pa. (Continued on page 376)



In the past, lathes were generally bought as large and as heavy as possible to insure accuracy and sufficient power. Now, with accurate, low-cost Sheldon Precision lathes, it is more profitable to buy these faster, cost-cutting lathes for the specific job at hand just as you would buy jigs and

In savings of tooling costs, operator cost, power cost, and plant loading, as well as extra profits from more pieces per hour, Sheldon lathes often pay back their cost on a single

run.

Sheldon lathes will work to the closest tolerances—have "Zero Precision" Taper Roller Bearings. They can take a healthy cut when operating at high speed direct drive—have double V-belts to the spindle. They will swing 10", 11" or 13" and have a 1%" hole through the spindle—have sufficient capacity for the great bulk of lathe work. Sheldon lathes have created a new factor for figuring machinery costs. They are tools you should know about.

Chicago 41, Illinois

SHELDON MACHINE CO., INC. 4246 N. Knox Ave.

0

Write

for Catalog



the productiontools' best friend

reduce tool wear help prevent tool breakage prolong tool life

Universal Bushings help keep tool costs down for several reasons: their superfinish bore helps reduce tool wear . their blended radius helps prevent tool hang-up and breakage • their 100% concentricity and hardness tests insure accuracy and uniform high quality • their knurled heads provide quick, sure grip • available in a

complete range of standard diameters and lengths . orders for special dimensions will be handled promptly · For complete information, write to the office nearest you - Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Avenue, Kenosha, Wis. or the home office.

176



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 2 MICHIGAN

- (1) BORING CHUCK
- (2) MIKRO-LOK BORING BAR
- (3) STANDARD COLLET CHUCK
- (4) FLOATING COLLET CHUCK
- (5) WEDGE-LOCK PRODUCTION VISE
- (6) "KWIK-SWITCH" TOOL HOLDER
- (7) STANDARD DRILL BUSHING
- (8) UNIVERSAL INDEX PLUNGER

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa. Erie Foundry Co., Erie, Po. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HARDENING EQUIPMENT

Gleason Works, 1000 University Ave., Rochester, N. Y. Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio. Gleason Works, 1000 University Ave., Roches-ter, N. Y.

HARDNESS TESTING INSTRUMENTS

Olsen, Tinius, Testing Mch. Co., Philadelphia Pa.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Shore Instrument & Mfg. Co., Van Wyck Ave.,
and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D
Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm

HOBS

HOBS

Barber-Colman Co., Rock and Montague, Rockford, III.

Brown & Sharpe Mfg. Co., Providence, R. I.

Michigan Tool Co., 7171 E. McNichols Rd.,

Detroit 12, Mich.

National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

National Twist Drill & Tool Co., Rochester,

Mich.

New Jersey Gear & Mfg. Co., 1470 Chestnut

Ave., Hillside, N. J.

Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich.

HOISTS, Chain, Etc.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

HOISTS, Electric

Philadelphia Gear Works Inc., Erie Ave. and G St., Philadelphia, Pa.

HONING MACHINES, External

Barnes Drill Co., 814 Chestnut, Rockford, III. Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio. Micromatic Hone Corp., 8100 Schoolcraft, De-trcit 4, Mich.

HONING MACHINES, Internal (Cylinder)

Barnes Drill Co., 814 Chestnut, Rockford, III. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio.

Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.

Moline Tool Co., 102 20th St., Moline, III.

Snyder Tool & Engrg. Co., 3400 E. Lafayette. Detroit 7, Mich.

HONING STONES

Barnes Drill Co., 814 Chestnut St., Rockford, III. Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. N.Y. Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio. Moline Tool Co., 102 20th St., Moline, III. Norton Co., 1 New Bond St., Worcester 6, Mass.

HONING TOOLS AND FIXTURES

Barnes Drill Co., 814 Chestnut, Rockford, III. Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio. Micromatic Hone Corp., 8100 Schoolcraft, De-troit 4, Mich.

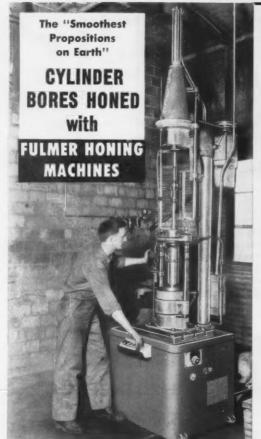
HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y. Nogren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.

HYDRAULIC MACHINERY **Tools and equipment**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio. Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.

(Continued on page 378)



EVEN so-called "smooth as a mirror" finishing is "rough stuff" compared to the A M A Z I N G L Y S-M-O-O-T-H AND STRAIGHT bores of cylinders finished with

FULMER HONING MACHINES

TOLERANCES as close as .0001 (\pm) . 15 sizes available for diameters from 1/4" to 30" and from 12" to 84" strokes.

FOR ferrous and non-ferrous metals, glass, plastic, etc.

Photo taken in plant of F. & F. Koenigkramer Co., Cincinnati, Ohio, honing bores of hydraulic cylinders.

> Write For Your Copy of our bulletin on honing.

1231 First National Bank Bldg.

Cincinnati 2, Ohio

Here's modern press control at its SAFEST



Yes, with the Schrader Two-Hand Press Control you'll find operator confidence soars—and so does production—because this easy-to-install unit can be operated only by both hands simultaneously. This means:

Production hits new highs as operators, no longer worrying about personal safety, develop a new high-speed work rhythm in short order.

2 Production stays high, because the effortless fingertip operation with Schrader Controls leaves operators fresh and alert, even after a full day's work.

Look over the mechanical-clutch machines in your shop. Wherever you find operators straining back and leg muscles to maintain production—tiring themselves so that they are less alert to safety precautions—there's a real need for Schrader Pneumatic Controls. Available for easy foot operation as well as two-hand operation as shown here, Schrader Control Sets come complete and ready for mounting on your presses.

Ask us to help you decide which of the several Schrader Control Sets will fit your needs best. Simply write us, outlining your installation—or fill cut the coupon below.



Leaders in air control since 1844





Division of Scovill Manufactor 454 Vanderbilt Avenue, Broa	uring Company, Incorporated oklyn 38, N. Y., Dept. T-1
I am interested in more inform	nation on
Name	Title

BEARINGS, BARS AND PARTS FOR EVERY INDUSTRIAL USE

delivery

or immediate Whether stock Johnson Bearings and Bars . . . or bronze castings, rough or machined ... our large facilities make possible early delivery. We are equipped to produce castings up to 18" OD and 20" length, in a wide range of alloys. Over 920 stock sizes of General Purpose (GP) Bearings and over 400 sizes of Universal Bronze Bars are available from stock through Johnson distributors. Write for catalog on these items . . . or send inquiries on special castings and bearings.

JOHNSON BRONZE COMPANY 520 South Mill Street . New Castle, Pa.

JOHNSON BEARINGS Sleeve bearing headquarters since 1901 All Johnson Universal Bronze Bars 13" length

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill. Barnes, John S., Corp., Rockford, Ill. Bethlehem Steel Corp., Bethlehem, Pa. Blirdsboro Steel Edry. & Mch. Co., Birdsboro, Pa. Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa. Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 2250 Bellevue Ave., Detroit 7, Mich. Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farguhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Hamilfin Corp., 501 S. Wolf Rd., Des Plaines, Ill. Hannifin Corp., \$01 S. Wolf Rd., Des Plaines, III.

Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.

Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, III.

Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

Watson-Stillman, Co., Div., H. K. Porter Co.

HYDRAULIC POWER UNITS OR TOOL HEADS

Barnes Drill Co., 814 Chestnut, Rockford, III.
Barnes John S., Corp., Rockford, III.
Barnes W. F. & John Co., 201 S. Waterford
St., Rockford, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
III. III.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.

Watson-Stillman, Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

INDEXING AND SPACING EQUIPMENT

INDEXING AND SPACING EQUIPMENT
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Frown & Sharpe Mfg. Co., Providence, R. I.
Hartford Special Mchry. Co., 287 Homestead
5t., Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St.,
Milwaukee 14, Wis.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee
5t., Rockford, Ill.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854
E 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
20, Mich.
Zogar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial

INDICATORS, Didi
Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginow, Mich.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

(Continued on page 380)

See why Tool Engineers call these heavy producers,

"MOST MODERN MACHINES OF THEIR TYPE"

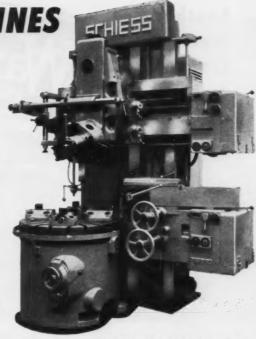
Hydraulic pre-selection of speeds set by handwheel and read on illuminated dial. 16 spindle speeds—ratio 1:50—up to 310 rpm for carbide machining on Model KE 100. Table runs on tapered roller bearings.

Fingertip control for direction of feed and rapid traverse with spring-loaded mono-levers for normal direction plus angular compound feeds. Mono-levers move in same direction as desired feed or traverse movement, simplify correct setting by operator. Specially designed electro-magnetic disc clutches disengage feed instantly with no over-riding or coasting.

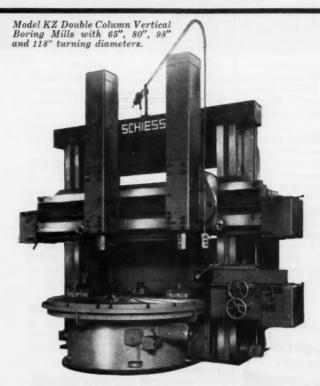
Counterbalanced cross rail and side head. Single lever unlocks, raises or lowers, and locks cross rail simultaneously by electromechanical controls. No bolts or nuts to loosen or tighten by hand.

All-vertical gear drive with main motor mounted on back of machine, directly connected to gear box. Changes in direction of drive transmitted to table without bevel gears, eliminating vibration and backlash.

Copying attachment with electric tracer for use either on cross rail or side head.



Model KE Single Column Vertical Turret Lathes with 40", 50" and 65" turning diameters for high-speed carbide machining.



All operating features of KE Series Vertical Turret Lathes are combined in

SCHIESS KZ DOUBLE COLUMN VERTICAL BORING MILLS, PLUS—

Heads equipped with steel octagon rams can be swiveled—have automatic feed in vertical, horizontal and angular direction and are independent of one another as to amounts and direction of feed.

Table operated by three-button pendant control. Standard model KZ Double Column Vertical Boring Mills are available with 65", 80", 98" and 118" turning diameters.

Get to know these products of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on these and all Schiess KE machines.

Engineering Division

AMERICAN

SCHIESS

C O R P O R A T I O N

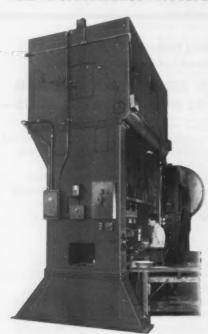
38th Street and AVRR, Pittsburgh, Pennsylvania

Sole Distributor





RYERSON - HAYNES Selects WARCO LINE on Performance Records . . .



Ryerson-Haynes of Jackson, Michigan, a large automotive stamping concern, recently built a new addition and added a large group of WARCO Presses, because they knew from past experience they could depend on Warco to deliver highest production at low maintenance cost.

People who have WARCO Presses working in their plants find, upon checking maintenance records and press operators' opinions, that WARCO Presses are out in front when it comes to low cost production and operator preference. If you're not now using WARCOs, contact our local representative and he will refer you to a user in your area - for he knows that where users compare, where performance at low cost is a factor, WARCO is your best buy.

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO



INDICATORS, Speed

Brown & Sharpe Mfg. Co., Providence, R. I. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Test

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave.,
Cleveland Is, Ohio.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y. Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

INTENSIFIERS, Hydroulic

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, P. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

JIG BORER

See Boring Machines, Jig.

JIGS AND FIXTURES

JIGS AND FIXTURES
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, III.
Jahn B., Manufacturing Co., Ellis St., New Birtiain, Conn.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind., Millholland, W. K. Machinery Co., 6402 Westfield Blyd., Indianapolis 5, Ind.
National Broach & Machine Co., 5600 St. Jean St., Detroit 13, Mich.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

JOINTS

See Fittings, Hydraulic, Pneumatic, Etc.

KEYS, Woodruff, Machine, Special.

Standard Automotive Parts Co., 660-668 Nims, St., Muskegon, Mich.

KEYSEATERS

RETSEATERS

Baker Bross, Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester, B.N. Y.
Lapointe Machine Tool Co., 34 Tower St.,
Hudson, Mass.

Mitts & Merrill, 68 Holden St., Saginaw, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I. Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Pratt & Whitney, West Hartford 1, Conn. Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

(Continued on page 382)

Vanadium - Alloys Steel Company

first quality* Die for Steels



made with the craftsmanship of lifetime specialization in Tool Steel—exclusively

Hofform The first 5% chromium hot work die steel—still first in strength and toughness combined with high resistance to heat checking. *Uses*: die casting dies, dummy blocks, extrusion dies, backer blocks, mandrels, hot piercers, hot forging dies.

Forge Die Resists softening at elevated temperatures, stays put under impact. 14% tungsten content. Uses: forge die inserts, extrusion dies, gripper dies, hot pressing dies, dummy blocks, hot piercing tools.

SC Special 14% tungsten plus increased carbon for higher wear resistance. *Uses*: hot forging dies and punches, extrusion tools, hot forming rolls.

Marvel 10% tungsten for high resistance to high temperatures. *Uses*: brass forging dies, extrusion press tools, nut dies and piercers, hot shears, hot swaging dies.

Hotpress Outstanding tungsten die steel with excellent toughness for work at elevated temperatures. *Uses*: dummy blocks for brass extrusion, press dies, extrusion dies, upsetting dies.

WW Hotwork Highly alloyed for greatest wear resistance at high temperatures. *Uses:* copper and brass extruding dies, brass die casting dies, copper tubing piercers, nozzles for zinc die casting machines.

Red Cut Superior-

J Temper

Tungsten High Speed Die Steel, with high hot hardness and wear resistance qualities. *Uses*: hot press dies for copper and brass, extrusion dies, hot and cold trim dies, punches, heading dies.

VANADIUM-ALLOYS STEEL COMPANY

Manufacturers of First Quality Tool and Die Steels

Latrobe, Pennsylvania

COLONIAL STEEL DIVISION . ANCHOR DRAWN STEEL CO.

In Canada:

Vanadium-Alloys Steel Canada Limited, London, Ontario



*guaranteed by deep etch, magnaflux, zyglo, and supersonic testing

LAPPING MACHINES

LAPPING MACHINES

Barnes Drill Co. (Straight Line or Rotating),
814 Chestnut St., Rockford, III.
Cincinnati Grinders, Inc., (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, III. (Lapmaster Div.)
Fellows Gear Shaper Co., 78 River St., Springfield, Vf.
Cleason Works, 1000 University Ave., Rochester, Ny.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 14, Milch. troit 4, Mich. Norton Co., 1 New Bond St., Worcester 6, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago. Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, III. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mtg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
Knapp, B. L., Ind. 107 N. Franklin Ave., Syracuse 4, N.Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Po.

Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio. McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa. Monarch Machine Tool Co., 27 Oak St., Sidney, Nonarch Machine 1001 Co., 27 Oak St., Slaney, Ohio. Pratt & Whitney, West Hartford 1, Conn. Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Moss. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford. Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.



TYPICAL CASE HISTORIES

Gun Barrels, heat treated steel castings, 280 to 340 Brinell, 9" to 11" dia., cut 1/2" to 3/4" deep, 34 RPM, .032" feed. Worm Shafts for Speed Reducers, 4140 SAE steel, 5" dia., cut 3/8" to 1-1/4" deep at 250 SFM, .011" feed.

For Maximum Feeds & Speeds

SAVE ON GRINDING COSTS with replaceable carbide inserts. They're furnished by us or by carbide manufacturers with pre-formed front and side clearance

LONG CARBIDE LIFE insured by two-way adjustment; forward by built-in adjusting screw, sideways by serrated clamp. Buttress serrations will not slip, hold carbide rigid.

DURABLE SHANK of special high-alloy steel, heat-treated for toughness and rigidity, outlasts many brazed tools. Tool steel anvil under carbide allows harder carbide grades, protects shank.

3 HOLDER STYLES, each right- and lefthand, made for straight turning, plunge cutting, and turning to shoulder.

LATHES, Automatic

LATHES, Automatic

Axelson Mfg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal.

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.

Bullard Co., Brewster St., Bridgeport 2, Conn. Cone Automatic Mch. Co., Inc., Windsor, Vt. Cross Co., 2520 Bellevue Ave., Detroit 7, Mich. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

Goss & DeLeeuw Mch. Co., Kensington, Conn. Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.

Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.

Pratt & Whitney, West Hartford I, Conn.

Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.

Senaca Falls Mch. Co., Seneca Falls, N. Y.

Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y. LeBlond, R. K., Mch. Tool Co., Madison and Edwards, Rds., Cincinnati 18, Ohio. Seneca Folls Mch. Co., Seneca Falls, N. Y. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N.Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N.Y.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox
Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

WRITE FOR CHIP-HOG BULLETIN AND PRICE LIST

The GAIRING Tool Company 21225 HOOVER RD., DETROIT 32, MICHIGAN



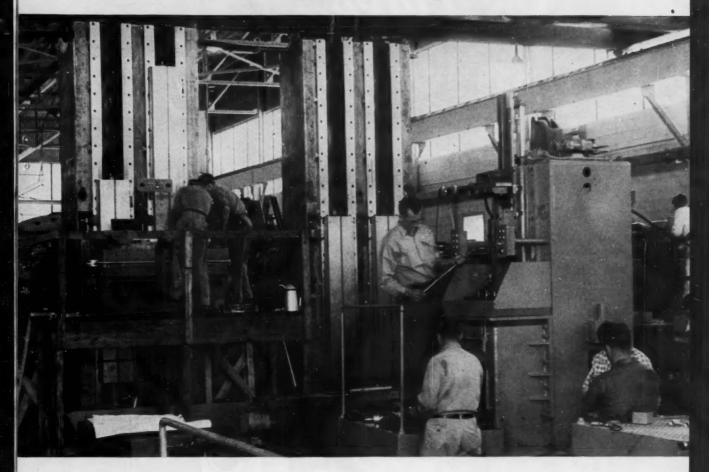
LATHES, Boring

LATHES, Boring

Axelson Mfg. Co., P.O. Box 15335, Verona St.,
Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholf Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

(Continued on page 386)

Years of Broaching Experience



Now Applied to Building THE FINEST IN BROACHING MACHINES

Detroit Broach is in the machine tool business!

It was a logical step for Detroit Broach to move into this activity. Here is a company that is known throughout the world as a pioneer and leader in the design and manufacture of broach tooling. The engineering abilities that have built this reputation, and the knowledge gained through the application of the tooling to machines of every make and model, are reflected in these new machines which are already demonstrating exceptional production efficiency in broaching. Incorporating proven features—such as Oilgear hydraulic equipment—with many advanced design ideas, they are establishing new standards in the broaching machine field.

Today, Detroit Broach offers you the "complete package" in broaching . . . from a single broach to a completely tooled machine . . . produced to meet exactly every requirement for accurate, trouble-free performance.

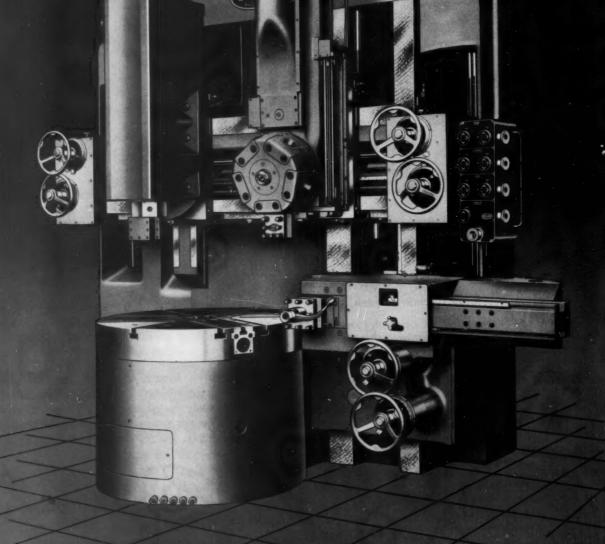
WHATEVER YOU
NEED IN BROACHING
DETROIT BROACH
CAN SUPPLY IT

Detroit Broach COMPANY

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

It's Here.

the MEW



CUTMASTER Model 75

A COMPLETELY NEW DESIGN OF VERTICAL TURRET LATHE

This new line has been engineered and designed to take full advantage of the latest improvements in cutting tools, methods and materials. Here are

some of its features:

- ★ PENDANT CONTROL, exclusive Bullard design, for maximum machine control from a movable pendant station. Start and stop spindle; selection of speeds, feeds and directional movement of all heads in feed or traverse are quickly and easily accomplished from the Pendant. Interlocks and a stop-all stick provide safety for both operator and machine.
- ★ ELECTRIC CONTROL PANEL Accessible yet concealed and protected from oil, dust and other foreign matter.
- ★ IMPROVED CUTTING COOLANT SYSTEM Adjustable conductors with flexible hoses for channeling coolant directly to cutting tools and adjustable heavy gauge steel guards designed for easy chip removal.
- * POWER INDEXED MAIN TURRET-(Optional)

Available in 26, 36, 46, 56, 66 and 76 inch sizes for shipment to you early in 1955.



BULLARD

For the complete story use this coupon for your copy of the new catalog.

BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT accesses to the new caming.

THE BULLARD COMPANY

286 Canfield Avenue . Bridgeport 2, Connecticut

Please send me a copy of the new Bullard Cut Master Vertical Turret Lathe Model 75 Catalog today.

NAME

COMPANY.....POSITION....

ADDRESS

CITY.....ZONE STATE



65-ton L&J Press

Here's the new No. 6 press that gives you more value through features that insure efficiency and

low production costs.

The heavy, rigid frame holds deflection to a minimum for greater accuracy and longer die life. Extra depth of throat adds versatility. Replaceable bronze bushings for main and upper ram bushings. Buttress threads on ram screw and replaceable hard bronze ball seat. Roller bearings in flywheel or main gear and backshaft mountings. Long, precision-scraped gibs maintain alignment and accuracy. Air clutch available. Also made in backgeared model.

SPECIFICATIONS

Strokes per minute	5
Ram stroke, standard 4	r
Max. stroke (to order)7	w
Throat depth	w
Die space, standard*	r
Special,* up to	w
*bed to ram, stroke down, adjust, us	D

Contact our local distributor for complete information. Also, 16 other O.B.I. models-6 to 80 ton capacities. Or, write for literature.



LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards RSa., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.

LATHES, Duplicating

Axelson Mrg. Co., P.O. Box 15335, Verona St., Los Angeles 58, Cal. H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N.Y. Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N.Y. Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich. Lodge & Shipley Co., 3055 Colerain Ave., Cin-cinnati 25, Ohlo. Monarch Machine Tool Co., 27 Oak St., Sidnsy, Ohio.

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y. Cord Corp., 405 Lexington Ave., New York 17, N. Y. H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y. H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y. H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y. H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y. H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y. Nellond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio. Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio. Monarch Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio. Morey Machiner Tool Co., 3401 Central Parkway, Cincinnati 25, Inc., 205 E. 42nd St., New York 17, N. Y. Yent & Witt & Co., Inc., 205 E. 42nd St., New York 17, N. Y. Yent & Whitney, West Hartford 1, Conn. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass. Rockford, Ill. Seneca Falls Mch. Co., Inc., 420-4258 N. Knox Ave., Chicago 41, Ill. Seneca Falls Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill. Sidney Machine Tool Co., Sidney, Ohio. Simmons Machine Tool Co., Springfield, Ohio. LATHES, Engine and Toolroom

LATHES, Gop

LATHES, Gap

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati P. Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta. Los Angeles 58, Cal. Consolidated Mch. Tool Corp., Rochester, N. Y. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Seneca Falls Mch. Co., Seneca Falls, N. Y. Springfield Machine Tool Co., Springfield, Ohio.

LATHES, Hollow Spindle

Axelson Mfg. Co., P.O. Box 15335, Vernon Sta, Los Angeles 58, Calif. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Lodge & Shipley Co., 3055 Colerain Ave., Cin-cinnati 25, Ohio. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type

Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich. Lipe-Rollway Corp., 806 Emerson Ave., Syra-cuse, N. Y. Lodge & Shipley Co., 3055 Colerain Ave., Cin-cinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio. Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom.

LATHES, Turret

Bardons & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Hardinge Brothers, Inc., (Bench or Cobinet
Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann Co., Carl., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Morey Machinery Co., Inc., 383 Lafayette St.,
New York, N. Y.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York, 17, N. Y.
Potter & Johnson Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albarry, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.
St., South Bend, Ind.
Cleveland 3, Ohio.

LATHES, Vertical Turret American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Lima Hamilton, Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS

Bullard Co., Brewster St., Bridgeport 2 Conn. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

LOCKNUTS

Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Cities Service Oil Co., 70 Pine St., New York, N. Y. N. Y. Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.

(Continued on page 388)



K5H grade insert tools successfully face aircraft forgings heat treated to 220,000 psi tensile

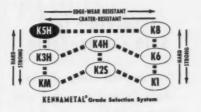
These tough, heat-treated SAE 4340 steel landing gear parts, heat treated to 220,000 psi tensile strength (Rockwell 47C), require severe jump cutting operations.

Using various grades of standard brazed tools, the Menasco Manufacturing Company rough and finish faced both sides at 87 RPM and .0035-inch feed. Even at this relatively low speed and feed, tool life was only two to four pieces per grind. Three cuts were necessary on each side of the forging. Approximately 6.35 minutes were required to change these tools—15 minutes to regrind them.

With K5H inserts in Kennamatic* tools, these forgings are now faced at 150 percent greater speed and twice the previous feed. Only two cuts are required on each face. Rotating the insert to a new cutting edge takes 45 seconds. Since three cutting edges are available on each end of the triangular insert, both sides of 54 pieces are faced before regrinding is necessary. Both ends of the insert are reground in 10 minutes.

K5H is the hardest of the Kennametal* grades. It is highly resistant to cratering, abrasion, galling and pick-up and is available in solid tools and inserts for precision boring and fine finishing of steel at high speeds. K5H is very strong for such a hard material.

The Kennametal Grade Selection Guide (below) offers you a simplified method for pin-pointing the exact grade of carbide that will assure top tool performance on every machining job. It shows that K5H is the hardest, most craterresistant of the Kennametal grades. If this grade is being used and cratering is no problem, a change to K8 will provide greater edgewear resistance. Or, if additional strength is desirable, K3H will improve tool life.



Tool breakage, chipping, excessive edge or top surface wear, heat checks and other causes of poor tool performance indicate a need for tool wear analysis. A Kennametal Tool Engineer is ready to help you with these problems . . . to help you select the best grade and tool for any job. In addition to his own broad experience, he has available to him the backgrounds of 150 other Kennametal Tool Engineers. He's as near as your telephone. Call him, or write to KENNAMETAL INCORPORATED, Latrobe, Pennsylvania.

*Registered Trademark

A25

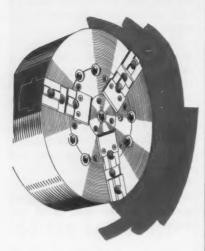






SKINNER

precision **POWER CHUCKS**



accurate · fast safe · dependable

"with power to push production"

Available from 6" to 24" with forged steel bodies, and with 2 or 3 adjustable, non-adjustable or serrated jaws. Double-acting rotating and non-rotating air cylinders available for all chuck sizes and for actuating all types of holding fixtures and tailstocks.

Write for catalog describing the complete line of Skinner power and manually operated chucks and accessories. Ask for movie "Chucks and Their Uses" for free showings.



CHUCK COMPANY

206 Edgewood Avenue, New Britain, Conn.

Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich. Sinclair Refining Co., 600 5th Ave., New York, N. Y. Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, III. Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, III. Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y.

LUBRICATING SYSTEMS

Farval Corp., 3249 E. 80th St., Cleveland, Ohio. Madison-Kipp Corp., Madison, Wis. Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo. Onsrud Machine Works, Inc., 3940 Palmer St., Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINE KEYS

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, III.

MACHINE PARTS, Special

Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, III.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MANDRELS

See Arbors and Mandrels.

MARKING MACHINES AND DEVICES

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Crane Parking Co., 1800 Cuyler Ave., Chicago. DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Federal Products Corp., P.O. Box 1027, Providence, R. I. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Norma-Hoffman Bearings Corp., Stamford, Conn. Norma-Hoffman Bearings Conn.
Conn.
Prott & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown,
Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Taft-Peirce Mfg. Co., Woonsocket, R. I. Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS

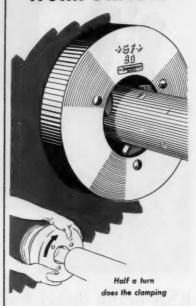
See Recording Instruments.

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Scherr, George, Co. Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass. Van Keyren Co., 176 Waltham St., Watertown, Boston, Mass.

(Continued on page 390)

SKINNER +GF+ **WORK DRIVERS**



- FAST
- POWERFUL
- EASY TO OPERATE

The Best for Turning on Centers

+GF+ Work Drivers drive smooth or rough bars and forgings located on centers. Jaws are easily reversed to accommodate direction of spindle

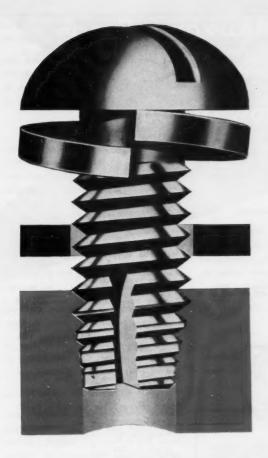
NOTE WIDE RANGES!

Type	36								1/4"	to	17/16"
Type	60								5/16"	to	23/8"
Type	90			٠		٠			1/2"	to	3 16"
Type	14	0						1	1/16"	to	51/2"
Type	20	0.			, ,		4	1	5/16"	to	81/16"

Write Skinner or your nearest Skinner distributor for illustrated folder.



206 Edgewood Avenue, New Britain, Conn



Eaton Thread-Cutting SPRINGTITES & SEMS

Faster Securely



WITHOUT TAPPING

Controlled quality . . .

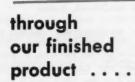


Whether it's a washing machine, turret lathe or locomotive, industrial production men and designers can save time and money by eliminating the need to tap parts before fastening. Design and production engineers in every field of industry can attest to the saving features of Eaton Thread-Cutting Springtites and Sems. They cut their own threads as they're applied thus cutting the cost of a production operation. In addition they seat tightly, thread against thread, eliminating the possibility of stripped or mismated threads.

from our own Steel Mill . . .



Made from the finest quality cold drawn steel, Eaton Thread-Cutting Springtites and Sems come in types 1, 23 and 25 making them ideal for use with sheet and stainless steel, die castings and





plastics. They are available with or without preassembled spring lock washer. You can test these Eaton cost cutting fasteners by writing for samples and a copy of Engineering Bulletin S-49A.

"SPRINGTITE" AND "HOZ-FAS-NER" ARE REGISTERED TRADEMARKS OF THE EATON MANUFACTURING COMPANY



OFFICE and PLANTS: 507 Charles St., S.E., MASSILLON, OHIO

SALES OFFICES: New York . Cleveland . Detroit . Chicago . St. Louis . San Francisco . Montreal







MACHINERY, November, 1954-389

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg., Co., Providence, R. I. Cincinnati Milling Machine Co., Cincinnati. Consolidated Machine Tool Corp., Rochester, N. Y. Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukse 14, Wis. Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Consolidated Machine Tool Corp., Rochester, Consolidated Maken, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, III.

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Kearney & Trecker Corp., Milwaukee, Wis. Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind. Pratt & Whitney, West Hartford 1, Conn. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill. U. S. Tool Co., Inc., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Barker Engrg. Co., 500 Green Rd., Cleveland 21, Ohio. Hardinge Bros., Inc., (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y. Pratt & Whitney, West Hartford 1, Conn. U. S. Burke Machine Tool Div., Brotherton Rd. Cincinnati 27, Ohio.

MILLING, MACHINES, Circular,

Consolidated Machine Tool Corp., Rochester, N. Y. Consolidated Machine 1001 Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoil Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio. onsolidated Machine Tool Corp., Rochester, Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa. Ingersoil Milling Mch. Co., 2442 Douglas St., Rockford, Ill. Kearney & Trecker Corp., Milwaukee, Wis. Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

MILLING MACHINES, Hand
Barker Engrg. Co., 500 Green Rd., Cleveland
21, Ohio.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd.
Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield
7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg., Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Carp., 405 Lexington Ave., New York, 17. Consolidated Machine Tool Corp., Rochester, N. Y.

N. Y.

N. Y.

Cosa Corp., 405 Lexington Ave., New York 17.

Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

Kearney & Trecker Corp., Milwaukee, Wis.

Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.

Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17 N. Y.

Pratt & Whitney, West Hartford 1, Conn.

Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg., Co., Providence, R. 1. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

MILLING MACHINES, Planer Type

MILLING MACHINES, Planer Type
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St., and Girard
Ave., Philadelphia, Po.
Giddings & Lewis Machine Tool Co., Fond du
Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn.
R. R., Evanston, Cincinnoti, Ohio.
Ingersoli Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.,
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.

Cosa Corp., 405 Lexinton Ave., New York 17. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III. Cincinnati Milling Machine Co., Cincinnati,

MILLING MACHINES, Rom Type

Van Norman Co., 3640 Main St., Springfield 7, Mass. (Continued on page 392)

This 25-TON Hannifin Straightening Press Sells For

FULLY EQUIPPED

Price F.O.B. our press plant at St. Marys, Ohio, subject to change without notice

The ideal press for straightening heattreated parts up to 60" between centers. Exclusive Hannifin Sensitive Pressure Control for speed and accuracy. Ram block, two table blocks and center-type fixture complete with rails included.

STRAIGHTENING PRESSES FROM 5 TO 150 TONS

Hannifin offers longer tables and rails, roller-type fixtures, larger or smaller capacities (5 to 150 tons)—all at prices that are easily justified by savings on the job. Bring us your straightening problems.

HANNIFIN CORPORATION, 509 S. WOLF ROAD, DES PLAINES, ILLINOIS

can the advantages of these Formsprag Clutches be put to work for

YOU-NOW?

ALL PURPOSE BALL BEARING CLUTCH—Designed for maximum accuracy and long life in high speed applications. Ideal for continuous duty, especially when prolonged over-running is a factor; also for rapid indexing operations.

PLAIN BEARING CLUTCH
Designed for slow speed applications
where loads are not excessive. In
general, tailored for intermittent duty

This most modern of clutches -the Formsprag Full Complement-has sprags running on concentric races without ramps. Design of the sprag provides a greater load capacity than any other type of working member. And-there are more working members (sprags) than in any other clutch-type. Formsprag's full complement of sprags always means MAXIMUM TOROUE CAPACITY in a small, compact unit. Write today for literature on the unit of specific interest to you.

SPECIAL PURPOSE BALL BEARING

and light loads only.

CLUTCH—Basically an indexing clutch, it is used extensively on spring coilers for feeding purposes. With adapters, however, it will perform adequately as an over-running or backtstop clutch. Additional bearing and oil seal must be inserted before installing.

New

SMALL CLUTCHES

To meet industry's demand for small size clutches of high torque capacity, low price, long life, and minimum maintenance.

New

LARGE-BORE CLUTCHES

For backstop applications requiring large-

New

CLUTCH-COUPLING UNIT

Required when you are coupling two shafts and want over-running features.

New

SERIES 50 CLUTCHES

Designed for applications where customer desires to provide his own inner race. An economical answer to specific applications. Consult factory for additional information.

Over-running

Indexing • Backstopping

ompany

FORMSPRAG

23609 Hoover Road

Van Dyke, Michigan

Distributors in principal cities



instruments there's no end to the variety of products improved by custom-cut

Perkins is a gear engineering organization with a 35 years' tradition of New England craftsmanship as background. As one of the country's largest producers of gears to customers specifications, Perkins will meet your specific requirements for gears - regardless of size, type, material or quantity desired, and at competitive prices. You furnish the specifications, we'll produce the gears.

PERKINS MAKES in all materials, metallic or nonmetallic, and in any size, to your specifications: helical gears, bevel gears, sprockets, ratchets, worm gears, spur gears with shaved or ground teeth, ground thread worms.

NOTE: The PERKINS PRECISION SPRING COILER is the latest development in the spring coiler field and eliminates entirely the use of arbors and long set-up time. It is a complete self-sufficient machine and enables you to make the spring you want when you want it—in seconds. The coiler produces any type of spring, in any diameter and any pitch with this range: Wire Sizes .005 to .125. Diameter from 3/32" to 12" and larger. Size of the compact coiler is only 7½ x 16". A POWER MODEL mounted on a welded steel console cabinet base is also available. Full information on request. request.



Gears!

Perkins Machine & Gear Company WEST SPRINGFIELD, MASS.

MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridge-port, Conn.

MILLING MACHINES, Vertical

MILLING MACHINES, Vertical
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati,
Ohio.
Corsolidated Machine Tool Corp., Rochester
N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave.,
Rockford, Ill.
Gorton, Geo., Mch., Co., 1110 W. 13th St.,
Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
U. S. Burke Machine Tool Div., Cincinnati 27,
Ohio.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLD AND DIE COPYING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17. Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Racine, Wis. Pratt & Whitney, West Hartford 1, Conn.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Rockford Machine Tool Co., 2500 Kiswaukee
St., Rockford, III.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div., H. K. Porter Co.,
Inc., Roselle, N. J.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio. General Electric Co., Schenectady, N. Y. Howell Electric Motor Co., Howell, Mich. Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md. Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

MULTIPLE-SLIDE FORMING MACHINES

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa. (Continued on page 394)



N

TWIST DRILLS
Straight Shank
Screw Machine
Taper Shank
Three & Four Groove
Heavy Duty
Extra Length
Aircraft
Automotive
Carbide

CUTTERS
Milling
Staggered Tooth
Gear
Screw Slotting
Woodruff
Corner Rounding
Angle
HOBS
Spur Gear
Stub Tooth
Involute Spline

METAL SLITTING SAWS Concave Sides Formed Teeth Side Chip Clearance

Sprocket

CUTTERS
Side Mills
End Mills
Reamers

Slotting Cutters

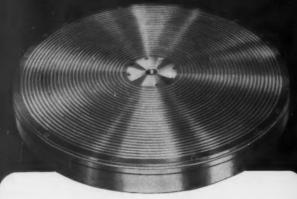
REAMERS END MILLS COUNTERSINKS COUNTERBORES CARBIDE TOOLS

UNION TWIST DRILL COMPANY . ATHOL, MASSACHUSETTS

End Mills Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass-BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec CUT INVENTORY COSTS, ORDER FROM YOUR LOCAL DISTRIBUTOR





Magna-Lock

electro-magnetic

ROTARY CHUCKS



On machines like vertical boring mills, rotary grinders and lathes, Magna-Lock Rotary Magnetic Chucks can solve tough holding problems.

Elimination of complicated fixtures substantially reduces set-up time, provides easier access to work piece.

Of rugged welded all steel construction, moistureproof and shock-proof, Magna-Lock Rotarys range in size from 61/4" diameter face to 72" diameter. Sectional type for automatic loading – unloading can be furnished.

Hold your hard-to-hold parts with Magna-Lock

— first to increase your machine's productivity.

Get details, DEPT. M-114.

Request Magna-Lock as original equipment on your new machines.



Hanchett MAGNA-LOCK
CORPORATION
Magnetic Chucks and Devices
BIG RAPIDS, MICHIGAN, U.S.A.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment,

NUT TAPPERS

See Bo't and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, III.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York,
N. Y.
Republic Steel Corp. (Union Drawn Steel Div.),
Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Ca., Div., Republic Steel
Corp., Massillon, Ohio.

NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago

NUTS, Thumb or Wing and Cap

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only). Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

OIL EXTRACTORS AND CLEANERS

De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Fischer Machine Co., 310 No. 11th St., Philadelphia, Pa.

OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, III. Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS

Madison-Kipp Corp., Madison, Wis. Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lublicating

Cities Service Oil Co., 70 Pine St., New York, N. Y. Houghton & Co., E. F. 303 W. Lehigh Ave., Philadelphia, Pa. Sinclair Refining Co., 600 5th Ave., New York. Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, III. Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, III. Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y.

OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York, N. Y. Houghton & Co., E. F. 303 W. Lehigh Ave., Philadelphia, Pa. Sinclair Refining Co., 600 5th Ave., New York.

(Continued on page 396)

ILLINOIS GEARS ...

made right sold right

ILLINOIS GEARS are made right—by skilled craftsmen equipped with the finest machine tools, plus precision inspection and quality control facilities.

Our gears are made to your specifications—with careful attention to materials, heat treatment and tolerances.

ILLINOIS GEARS are sold right—all sales are controlled directly from our main offices and works. All ILLINOIS GEAR salesmen are gear specialists with many years of experience in the specification and manufacture of gears of all types. We sell but one product—quality gears.

If you want gears that are made right and sold right—if you demand only the best—if you countenance no compromise with quality—call ILLINOIS GEAR & MACHINE COMPANY.

Look for this mark (IL) —it's the symbol on finer gears



Gears for Every Turpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

2108 NORTH NATCHEZ AVENUE

CHICAGO 35, ILLINOIS



In a four month period under actual competitive conditions one Diamond Wheel ground 36,976 pieces, while eight silicon carbide wheels ground a total 16,023 pieces.

RESULT - 1. Less cost per piece 2. Greater Production 3. Less down time.

See for yourself how

SECOMET DIAMOND WHEELS

can provide you with these plus values

Send for informative catalog #54 or contact us direct for information and assistance.



J. K. SMIT & SONS, INC.

MURRAY HILL, N. J.

Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, III. Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, III.

OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

ORDNANCE MACHINES, Spelial

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago. Garlock Packing Co., Palmyra, N. Y. Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa. Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio. Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis, Ind.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I. Lurkin Rule Co., Hess Ave., Saginaw, Mich. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I. Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Link-Belt Co., 519 N. Holmes Ave., Indian-apolis 6, Ind. Norma-Hoffman Bearings Corp., Stamford, Conn. Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y. N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave.,
New York, N. Y.

PIPE, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland
1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
United States Steel Corp., National Tube Co.,
Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa. (Continued on page 400)

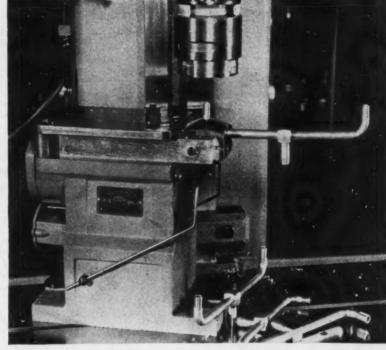
Quicker changeover, lower tooling costs...

with SNOW FULL UNIVERSAL MACHINES

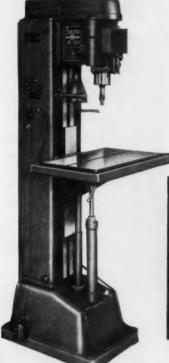
ELECTRICALLY OPERATED AIR CONTROLLED AUTOMATIC OR SEMI-AUTOMATIC

Basic Master Fixtures for DRILLING, THREADING or TAPPING. Snow universal machines are the most flexible, most efficient, and most economical known. They save countless dollars in changeover time — help you start jobs sooner — assure quality at high production rates.

The square footage under a Snow Machine in your factory can be the most profitable in your whole plant. Submit details of your requirements.



AIR VISE holds part firmly — self-centering — always in exact position for precision work. U-shaped wire underneath provides quick finger-tip control, automatically starting spindle cycle. Jaw inserts keep tooling costs at minimum. Blank jaws always in stock — can be tooled to fit your part promptly, inexpensively.





Irregularly shaped parts are easily handled. Front feed permits close setting of guide plate for greater accuracy with high production. Here a short AIR VISE mounted on an offset table holds long tubing. Piece-part switch under table automatically closes vise and starts tapping operation.

SNOW MANUFACTURING CO., BELLWOOD, ILL.

(Suburb of Chicago)

853

Screw Matic 750

ATTACHMENT MOUNTING .

WORK SPINDLE -

Driven by independently supported V-belt and sheave.

CROSS SLIDES -

Direct cam operated.

SPINDLE SPEED

Infinitely variable and reversible.
Controlled by simple dial setting.
Three preset, independent cutting speeds are conveniently adjustable during cutting.

TURRET SLIDE

Equipped with a three-position crank setting to adjust turret unit away from the spindle.

PARTS RECEIVER

OPEN FRONT DESIGN

Provides unrestricted room for turret tools and chip flow space.

HAND WINDING FACILITY

Constant ratio.

TURRET LEAD CAM

Readily mountable and always visible.

TURRET AND CAMSHAFT UNIT

Self-contained and slideable along machine bed.

MACHINE BASE

Sturdy, one-piece, rigid cabinet. High walls give protection against oil spillage.

OVERLOAD SAFETY DEVICE

Readily accessible position and easy to reset.

WORDS about a Completely New Screw Machine

Now, for the first time in 20 years, a new development has been made in screw machine engineering. Three new design principles have been incorporated in the Gear Grinding Machine Company's SCREWMATIC 750 that, in terms of lowered costs and increased production, make it the greatest advancement in screw machine history:

- 1. Infinite variable spindle speeds instead of gearing.
- Work spindle drive through V-belts instead of roller chains.
- Low pressure air cylinders for stock feeding instead of a constant speed backshaft.

These design elements have made possible many outstanding performance features. The SCREWMATIC 750 is now ready to give you—

Higher Work Output Because . . .

An infinitely variable spindle speed drive permits a choice of three different spindle speeds in any cycle of work. Various speeds are obtained by a simple dial setting and are adjustable during actual tool cutting. Reversibility of any of the forward speeds eliminates need of left-hand tools.

Greater Precision . . .

Through arrangement whereby the precision spindle bearings carry cutting tool pressures only. No drive members or clutch bodies are carried by the spindle proper. The precision spindle bearings are anti-friction non-adjustable standard type.

Chatterproof, accurate forming is assured by heavy section cross slides, guided on vertically arranged dovetails. Slide unit is mounted upon deep wall supports. Slides are direct cam actuated. Micrometer adjustment and concealed dead stops are provided.

A six station turret is held in precision needle bearings and locked in hardened taper bushings. This assures accuracy through perfect tool alignment with work spindle. A subbase slide guide permits ready realignment after years of service.

Tool and Cam Layout Simplified . . .

Infinitely variable spindle speeds, together with unrestricted tooling space, simplify tool and cam layout computations. Machine operators will appreciate the fully visible lead cam and setup facilities.

Outstanding Work-length Capacity...

A turret slide unit, including the lead cam and drive, mounted longitudinally, slides along the machine base. The unit can be positioned away from the spindle so as to permit work pieces up to 6 inches in length to be machined with turret tools.

Even at such lengths, no tool crowding exists—nor are cam "cut downs" required.

This arrangement does not impair economical production of long, short, or medium length parts, for the turret slide and index stroke and speed can readily be changed to suit such parts. All work is produced in the most expedient, economical manner.

Tooling Accessibility . . . Free Chip Flow . . .

The open front design, with its high wall cabinet, permits maximum tool accessibility and tooling space. Chips flow into an ample size, deep chip well. Open ended provision permits chips to be removed from well during machining operations.

Tooling and Attachments . . .

The SCREWMATIC 750 accommodates standard collets, feed fingers, cams and tool holders. In designing the SCREWMATIC 750, special emphasis was placed on incorporating in the machine facilities to adapt readily all commonly used attachments without obstructing the accessibility to tools or the free chip flow.

Simplified Machine Versions to Suit Customer Requirements . . .

The unit design permits the SCREWMATIC 750 to be supplied in simplified forms for long run production of simple parts. The machine can be delivered without such features as variable spindle speeds and spindle reversal. The turret slide can be replaced by a plain tool slide. The spindle is then driven directly from an electric motor over V-belt sheaves.

Capacity . . .

The SCREWMATIC 750 takes bar stock up to .750 inches diameter. For heavy duty machining, standard size collets and feeders are used. The maximum standard spindle speed is 5100 r.p.m.'s. Higher speeds are available on request.

The longest lengths that can be turned with a standard 7-inch diameter cam are 21/4 inches. Longer turning lengths are obtainable with a larger diameter cam.

Cam shaft cycle speeds range from 1.8 to 240 seconds. The SCREWMATIC 750 accommodates standard turret tools with shank diameters of .750 inches.

The SCREWMATIC 750 is manufactered by The Gear Grinding Machine Co.—a company known for its accomplishments in precision, speed, and automation in the field of gear grinding . . . the company that produces the intricate Rzeppa Constant Velocity Universal Joint.

Should you wish detailed information and photographs, use the coupon below.



The Gear Grinding Machine Co.

3921 Christopher • Detroit 11, Michigan

We are interested in receiving more information on the new Detroit SCREWMATIC 750.

Company Name

City_____State
Send to the

Attention of

IT'S NEW!



Newest addition to MILLERS FALLS famous line of cost-cutting tools for industry

This rugged, high-production tool cuts sheet metal — up to 16 gauge (.060") in steel and galvanized sheet — up to 50% greater in aluminum, copper and other non-ferrous metals. Blade adjustments for different jobs are quickly made — with hex keys conveniently located in tool handle.

In power, in quality, in design, the new No. 16 Portable Electric Shear is an outstanding addition to Millers Falls line of electric tools for production and maintenance... including drills, high-speed die grinders, heavy-duty grinders, saws, hammers, sanders, polishers, screw drivers and nut runners.

Compare the features

Write for free literature on the new Millers Falls Shear, on Millers Falls complete selection of high-performance, advanced-design electric tools. Demonstrations will be quickly arranged on request.

MILLERS FALLS COMPANY Dept. M-4, Greenfield, Mass.



On straight lines or curves, from inside or outside, Millers Falls new No. 16 Portable Electric Shear cuts clean and fast. Light weight — only 8 lbs. Minimum radius for left hand cuts is ½", for right hand cuts, 1¼". High cutting-line visibility. Precision-ground, heat-treated alloy steel blades are quickly removed for resharpening. Built to Millers Falls quality standards, the No. 16 Portable Electric Shear is the latest star in a notable line of industrial electric tools.



PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcon St., Buffalo 7, N. Y.

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Gray, G. A., Co., Woodburn Ave., and Penn R. R., Evanston, Cincinnati, Ohio. Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, III.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate). Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A. Co., Woodburn Ave., and Penn R. R., Evanston, Cincinnati, Ohio. Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, III.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Bethlehem Steel Co., Bethlehem, Pa. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio. Corsolidated Mch. Tool Corp., Rochester, N. Y. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago, 18, III.

PLATES, Angle

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I. Challenge Machinery Co., Grand Haven, Mich. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh & Po. DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Pratt & Whitney Div., West Hartford I, Conn. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa. Taft-Peirce Mfg. Co., Woonsocket, R. I. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J. Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
III.
III.
III.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.
Onsrud Machine Works Inc., 3940 Palmer St., Chicago, III.

POLISHING LATHES AND MACHINES

Black & Decker Mfg. Co., Penna. Ave., Tow-son, Md.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

(Continued on page 402)

WHEN THREADS HAVE TO BE

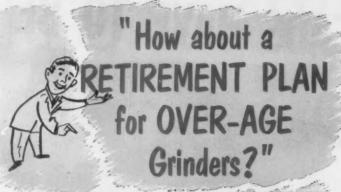


Detroit thread plug and thread ring gages have long been noted for their high degree of accuracy and long life.

Now, in addition to accuracy and quality, Detroit Tap and Tool can make prompt delivery on Standard American National thread gages as well as on gages for Unified threads, American Standard pipe threads, Aeronautical pipe threads or Dryseal pipe threads. Many special size thread ring and thread plug gages are also carried in stock for immediate shipment.

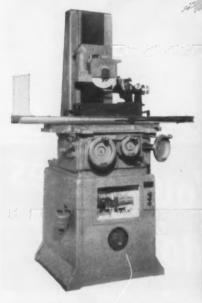
See your local Detroit Tap and Tool representative today. Ask for our complete Catalog-Price List (SG-53) covering standard thread gages.





Navally his a sensible lideal to recent surveys show that ON out of every FIVE grinders now in operation is eligible for retirement, being incapable of meeting today's precision toel-





remium in efficiency and profits, modern managenent finds that if makes lacing them with REID orface Grinders . . . for REID Grinders are famed s precision Grinders, prered by industry for dependable accuracy

Your REID Dealer will how you how easy and conomical it is to replace over-age Grinders with modern, efficient, REID recision Surface Gri

FOR REPLACEMENT

For the complete story on Reid Surface Grinders please write for Bulletin 618-2.

Reid Brothers Company. BEVERLY, MASSACHUSETTS

POLISHING TOOLS, Portable

Sunstrand Machine Tool Co., 2531 11th St., Rockford, III.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool

PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Dake Engine Co., 604 Seventh St., Grand Haven, Mich. Div. Oliver Corp., 142 North Duke St., York, Pa. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. III.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich. Doke Engine Co., 604 Seventh St., Grand Haven, Mich. Farguhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa. Ferracute Machine Co., Bridgeton, N. J. Lake Erie Engra. Co., Kenmore Station, Buffolo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Extrusion

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Poddock Rd. and Tennessee Ave., Cincinnati. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.

Chambersburg Engrg. Co., Chambersburg, Parquhar, A. B., Div., Oliver Corp., 142 North Duke St., York, Pa. Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.

Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Ferracute Machine Co., Bridgeton, N. J. Niagara Machine & Tool Works, 683 North-land Ave., Buffalo, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton,
Ohio. Biss Co., E. W., 13/3 Karr Kd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, III.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Farguhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg., Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y. (Continued on page 404)

Four Cleveland Underdrive Presses Ordered for New Ford Cleveland Stamping Plant

Four of these Cleveland underdrive presses are scheduled for early installation at Ford Motor Co.'s new Walton Hills Stamping Plant. Why? Because Ford production men have found two important operating economies are gained by using underdrive presses.

Maintenance is obviously far easier. When necessary, major adjustments or repairs can all be made at convenient floor level. Hours saved by this convenience are of utmost importance where in-line automatic or semi-automatic production techniques are employed.

Underdrive press design minimizes press height on production floor. This means better lighting and more freedom of material flow. Press area is cleaner and safer for all drive mechanisms and attendant oil and grease are in separate area. There are no overhanging projections.

Perhaps you, too, can use Cleveland underdrive presses to advantage. But whether your needs call for single, two or four-point presses of overdrive or underdrive design let us show you why Cleveland presses are your best buy for operating economy.

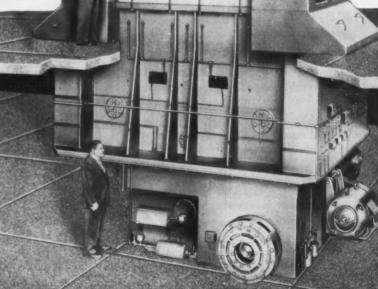
A-9999

CLEVELAND FOUR-POINT

This double-geared, twin-drive press features air counterbalance, an air brake on the flywheel, a dynamatic clutch and pneumatic cushions in the bad.



Established 1880



E. 40th & St. Clair Avenue, Cleveland 14, Ohio

Offices at: NEW YORK . CHICAGO . DETROIT PHILADELPHIA . E. LANSING . OXFORD, O.

CITY FOUNDRY DIVISION . SMALL TOOL DEPARTMENT





... Ready to Help You

Photo shows a standard P3-2 profiling ports in an aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic. A combination of other methods would do the cutting in hours, but the P3-2, with an automatic cutting cycle, finishes each port in 2.3 minutes.

Improve Production and Lower Costs

Gorton tracer-controlled equipment does efficient profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving and many other standard or special operations. You can expect high accuracy and high surface finish, whether your work involves metals or plastics in flat, uniformly curved, cylindrical or irregular shapes.

Enlarged templates, masters or patterns, all quickly and easily made, give Gorton Pantographs advantages of increased accuracy through reduction ratios. Work pieces range in size from the diameter of a dime to 10 feet. Cutting cycle is accomplished manually or automatically.

Fill out and mail the coupon for your copies of the Gorton catalog and the informative booklet, "Pantography."



GEORGE GORTON MACHINE CO.



Please the Go	send at	once comp	lete inf in Bul	ormati letin 1	655	out 311
Firm	************			************	*******	
Name	***********			*********		

MACHINE GU.

Title

Address

1311 Racine St., Racine, Wis., U.S.A. City, State

A 7786-3/3

Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts. Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg, Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bridsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bilss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Div. Oliver Corp., 142 North Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Honfrin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Alliance, Ohio.
Niagara Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.

PRESSES. Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Dake Engine Co., 604 Seventh St., Grand Haven, Mich. Ferracute Machine Co., Bridgeton, N. J. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Sheet Metal Working

Allen, Alva F., Box 426, Clinton, Mo. (Bench)

American Steel Foundries, Elmes Engra. Div.,

Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div.,

Phildalejhia 42, Pa.

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton,

Ohio.

Chambersburg Engra, Co., Chambersburg, Pa.

Cincinnati Shaper Co., Elam and Garrard

Aves., Cincinnati, Ohio.

Clearing Machine Corp., 6499 W. 65th St.,

Chicago 38, Ill.

Cleveland Crane & Engra. Co., Wickliffe, Ohio.

Cleveland Crane & Engra. Co., Wickliffe, Ohio.

Cleveland Punch & Shear Works Co., 3917 St.

Clair Ave., N. E., Cleveland, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y.

Dake Engine Co., 604 Seventh St., Grand

Haven, Mich.

Danly Machine Specialties, Inc., 2107 S. 52nd

Ave., Chicago 50, Ill.

Dreis & Krump Mfg. Co., 7416 Loomis Blvd.,

Chicago 36, Ill.

Espen-Lucas Machine Works, Front St., and

Girard Ave., Philadelphia, Pa.

Farquhar, A. B., Div., Oliver Corp., 142 North

Duke St., York, Pa.

Ferracute Machine Co., Bridgeton, N. J.

Hydraulic Press Mfg. Co., 300 Lincoln Ave.,

Mt. Gilead, Ohio.

Lake Erie Engra, Corp., Kenmore Station, Buf
falo, N. Y.

L. & J Press Corp., Elkhart, Ind.

Minster Machine Co., Minster, Ohio.

Niagara Machine & Tool Works, 683 Northland

Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y. Sales Service Mch. Tool Co., 2363 University Ave., St. Pau, Minn. Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicogo, Ill. Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle N. J. (Continued on page 406)



When working to a tolerance of four milwho is a manager of a torrante of your mil-lionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

- HARDENED AND GROUND cross slide ways com-
- pletely sealed.

 One shot lubrication to cross slide ways and internal saddle bearings. · HARDENED AND GROUND sealed anti-friction
- · HARDENED AND GROUND BED WAYS with
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.
- Elevation micrometer stop graduated in .0001".
 GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse. Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005"
- GROUND THREAD FEED SCREW.

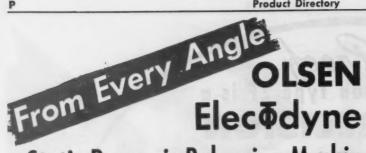
WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Obio.

COPYRIGHT 1951 BY THE THOMPSON GRINDER CO.

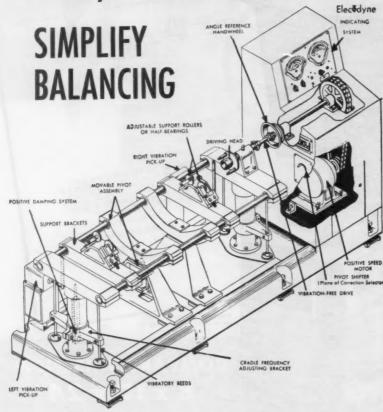
The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio



Static-Dynamic Balancing Machines



- Automatic Angle and Amount Indication with the Elec

 dyne electronic indicating system—an Olsen exclusive.
- Easy Operation. Operator merely inserts the part and starts the machine. In a matter of seconds he knows the amount and angle of unbalance in both planes of correction.
- Positive Plane Separation. Exclusive Tinius Olsen pivoted cradle design assures positive plane separation. Only unbalance in the selected plane of correction is indicated.
- Simplicity of Calibration. Both the Angle and Amount Meters can be calibrated quickly with the aid of a screw driver. Expensive "masters" and trial and error methods to obtain a "zero" balance are eliminated.

These are just a few of the advanced features of Tinius Olsen Balancing Machines. Details are given in Bulletin 49, a copy of which will be sent upon request.

Testing & Balancing Machines

TINIUS OLSEN TESTING MACHINE CO.

2080 Easten Road - Willow Grove, Pa.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div Paddock Rd. and Tennessee Ave., Cincin nati, Ohio.

Anderson Bros., Mfg. Co., 1910 Kishwaukee St., Rockford, III.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar, A. B., Div., Oliver Corp., 142 North Duke St., York, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.

III.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works (Hydraulic),
683 Northland Ave., Buffolo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co.,
Inc., Roselle, N. J.

PROFILE—TRACING ATTACHMENTS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe).

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Machinery Co, Inc., 383 Lafayette St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III.
Prott & Wilston. Work M. T. Chicago, III. Pratt & Whitney, West Hartford 1, Conn.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

PUMPS, Coolant, Lubricant and Oil
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620
E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave.,
Logansport, Ind.
Pioneer Pump Div., Detroit Harvester Co.,
14300 Tireman Ave., Detroit 28, Mich.
Ruthman Machinery Co., 1809 Reading Rd.,
Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson
Blvd., North Bergen, N. J.
South Bend, Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers Inc., 1402 Oakman Blvd., Detroit,
Mich.
Wiking Pump Co., Cedar Falls, Iowa.

Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, III.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.

(Continued on page 408)

First choice of cost-wise buyers

BOSTON , cor.



6562 "off the shelf" STANDARD STOCK TRANSMISSION PRODUCTS











STOCK GEARS: Spur . Racks . Miter . Bevel . Helical . Worms and Worm Gears

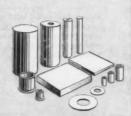


SPROCKETS and CHAIN For drives ranging from fractional to 40 hp



SHOLD-A-GRIP Interchangeable Tapered BUSHINGS and SPROCKETS

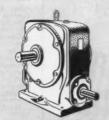
Fit sprockets up to 24" pitch dia. to any shafts ½" to 3" by 16ths



BOST-BRONZ oil-impregnated BEARINGS



RATIOMOTORS
Motorized Speed Reducers
32 types—1/20 hp to 3 hp



REDUCTORS
Standardized Speed Reducers
.005 hp to 36 hp



Certified
BEAR-M-BRONZ
Solid Bronze
BEARINGS











STANDARDIZED TO SIMPLIFY YOUR MAINTENANCE AND DESIGN

Standardized, completely interchangeable, precision Gear Products, they meet practically all needs, for maintenance replacements, for machinery built for plant use, for drive assemblies in products you make.

IN STOCK NEARBY—NO DELAYS AND COSTLY DOWNTIME

In emergencies, can be delivered immediately, saving downtime.

FIRST QUALITY AT LOWER COST

BOSTON GEAR quality control gives you unequalled precision, finish, and performance. Compare costs — the savings will surprise you.

SELECTION ADVICE FROM SPECIALIST

Information is quickly available from your Distributor's factorytrained specialist, or BOSTON GEAR Field Engineer when desired.

PRODUCTION QUANTITIES— REDUCTORS and RATIOMOTORS

BOSTON GEAR Engineering Dept. will help you design custom built, high-efficiency, low-cost Ratiomotors or Reductors into your product. Send prints and specifications. A qualified Field Engineer will call at your request.

WIDEST SELECTION

BOSTON GEAR Catalog lists 102
Product Groups — includes 30
pages of engineering data. Get
a copy from your BOSTON GEAR
Distributor or write Boston Gear
Works, 65 Hayward St., Quincy
71, Mass.

54-AP4

At 96 Authorized

BOSTON

Distributors

a \$10,000,000 stock for

"off-the shelf" deliveries

Look under "Gears" in the Yellow Classified Section of your Telephone Directory for Distributor nearest you ORDER FROM YOUR NEARBY



DISTRIBUTOR—at Factory Prices



CONSIDER the outstanding advantages you will gain by designing Twin Disc Oil-Actuated Multiple Plate Clutches into your machines: 1 You'll eliminate entirely the need for clutch adjustment, and maintain constant torque. The integral oil cylinder acts as a floating pressure plate, automatically increasing in travel as the plate stack wears. The torque value cannot decrease . . . there is no chance for an inexperienced operator to "burn up" the clutch. 2 With bigb, constant torque capacity, it is often possible to use a smaller size clutchpermitting more compact instaladaptability to remote control, eliminating complicated actuating linkage. 4 You'll benefit from consistently longer wear-life, since there is no possibility of plate slippage.

Write to Twin Disc Clutch Company, Racine, Wisconsin, for complete information.

Blueprint of Model MOS (single) and cutaway view of Model MOD (duplex) show interlocked pistons of Twin Disc Oil-Actuated Multiple Plate Clutch. Write for latest Bulletin No. 305.



TWIN DISC CLUTCH COMPANY, Razine, Wisconsin + HYDRAULIC DIVISION, Rockford Illinois

Branches or Sales Engineering Offices: Cleveland * Dallas * Detroit * Los Angeles * Newark * New Orleans * Seattle * Tulsa

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md. Co., 300 Lincoln Ave., Mt. Gilead, Ohio. Ingersoll-Rand Co., Phillipsburg, N. J. Lapointe Machine Tool Co., 34 Tower St., Hudson; Mass. Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis. Pioneer Pump Div. Detroit Harvester Co. Wis.

Pioneer Pump Div., Detroit Barvester Co., 14300 Tireman Ave., Detroit 28, Mich.

Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.

Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich. Mich.
Wising Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit
28, Mich. Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

POMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.

Pioneer Pump Div., Detroit Harvester Co.,

14300 Tireman Ave., Detroit 28, Mich.

Sier-Bath Geor & Pump Co., Inc., 9248 Hudson

Blvd., North Bergen, N. J.

Sundstrand Machine Tool Co., 2531 11th St.,

Rockford, Ill.

Tuthill Pump Co., 939 E. 95th St., Chicago 19, III. Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich. Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Allen, Alva F., Box 426, Clinton, Mo. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th
St., Chicago 18, III.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co.,
Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon
Ave., Philadelphia, Pa.

RACKS, Gear Cut

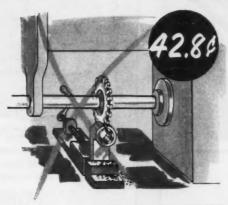
Amgears, Inc., 6633 W. 65th St., Chicago 38, Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I. Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, III.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio. Ohio Gear Co., 1950 Ohio, Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa. Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich. Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.

(Continued on page 410)

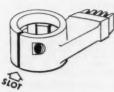
SAME SLOTTING OPERATION





Slotting 24 Parts	Milling Machine	DoALL Band Machine
Time, Including Set-up	102 minutes	39.5 minutes
Cost per slot	42.8¢	17.7¢

Is your plant saving money with this newest Machining Method?



View of completed part on which slatting cost was reduced from $42.8 \, \phi$ to $17.7 \, \phi$.

A DoALL power feed band machine costs but 1/5 to 1/2 as much as a production milling machine, shaper or planer. It cuts faster. Tool cost is lower. Fixturing is simpler. Set-up time is less. It can perform many operations better than can the more costly machines. These include slotting, splitting, notching, angle cutting and other jobs. Highest machine tool accuracy is secured. Automatic power feed is provided, as is a built-in coolant system. Tool speeds are variable. High speed steel blades are available which provide remarkable cutting rates and far outlast carbon steel.

The "bandsaw" has come of age as a production line machine tool. To help you visualize the jobs it can do at lower cost, DoALL has developed a new production band machining demonstration, complete with fixtures and duplicate parts. To have a machine brought to your plant and demonstrated from the truck, call your local DoALL Service-Store or write:



New Model 26-3 DoALL Band Machine has power feed table, coolant system, variable tool speed and more power than previous models.

The DoALL Company, Des Plaines, Illinois.

New wall chart free: "How Basic Tools Created Civilization," Make request on your company letterbead.

Band Machines . . . Saw Bands . . . Precision Surface Grinders . . . Black Granite Surface Plates . . . Gage Blocks and Other Precision Measuring Instruments . . . Tool Steel . . . Cutting Tools and Supplies

PB-2



38 DoALL Stores serve industry. See classified directory for one nearest you.



TF you use gears in the product you make, we believe it will pay you, as it has others, to become acquainted with FAIRFIELD-the place where fine gears are produced to meet your specifications EFFICIENTLY, ECONOMICALLY! Fairfield's production facilities are unexcelled for making all kinds of accurate, automotive type gears such as are now finding wide use in all branches of industry: for Tractors, Trucks, and Buses . . . for Agricultural Implements . . . for Machine Tools. Ask for latest literature describing Fairfield's facilities. Your inquiry will receive prompt attention.

Fine Gears Made to Order

SPUR GEARS - Straight, helical, and internal. Sizes from 16 pitch, 1½" dia., to 1½ pitch, 36" dia.

HERRINGBONE-(Fellows Type), Sizes from 11/2" to 15".

SPIRAL BEVEL - Sizes from 16 pitch, 11/2" dia., to 11/2 pitch, 28" dia.

STRAIGHT BEVEL-Sizes from 16 pitch. 11/2" dia., to 11/2 pitch, 28" dia.

HYPOID-Sizes from 11/2" to 28" dia.

ZEROL - Sizes from 16 pitch, 11/2" dia., to 11/2 pitch, 21" dia.

WORMS AND WORM GEARS-Worms to 7" dia. Worm gears to 36" dia.

SPLINED SHAFTS - Lengths to 52". Diameters from 1" to 6".

DIFFERENTIALS - 10,000 to 300,000 inch pounds capacity.

> Note: All of the sizes above are approximate.

FAIRFIELD



2331 South Concord Road

Lafayette, Indiana

McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa. Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III. Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3. Ohio.

REAMERS

Barber-Colman Co., Rock and Montague, Rockford, III.

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Celi-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich. Barber-Colman Co., Rock and Montague, Rock-ford, III. burgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit
32, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide &
Carbon Corp., 30 E. 42nd St., New York,
N. Y. Carbon Corp., 30 E. 42nd St., New York, N.Y.
Keo Cutters, 19326 Woodward, Detroit, Michipe-Rollway Corp., 806 Emerson Ave., Syracuse, N.Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Toft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rock-ford, III. Barber-Colman Co., Rock and Montague, Rockford, III.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Trat & Whitney, West Hartford 1, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

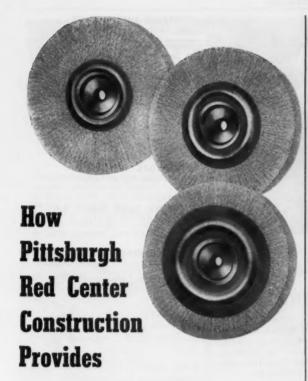
REAMERS, Toper Pin

Butterfield Div., Union Twist Drill Co., Derby Butterfield Div, Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, WisLipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich. Mich. Kaufman Manufacturing Co., Manitowac, Wis. Pratt & Whitney, West Hartford 1, Conn. Van Norman Co., 3640 Main St., Springfield 7,

(Continued on page 412)



Faster cutting while maintaining smooth finish . Freedom from shedding • Perfect balance • Longer life

In conventional brushes, when faster cutting action is desired, coarser wire is used. But increasing the wire gauge causes brittleness, destroying the wearing quality of the brush, and resulting in excessive scoring of the work.

Pittsburgh has solved this problem by maintaining the same ideal gauge wire in every brush, but increasing the fill and diameter of the hub and center plate of brushes designed for faster cutting. Thus, although cutting speed is increased, work remains unscored and the wire does not lose its inherent power to flex. These Red Center brushes last longer, maintain perfect balance throughout life, and do a better job all around.

This is just one example of superior Pittsburgh construction, engineered for both general and specific applications. For details of the complete line, write for free Catalog #54-W. Address: PITTSBURGH PLATE GLASS Co., Brush Div., Dept. W11, 3221 Frederick Ave., Baltimore 29, Maryland.

PITTSBURGH

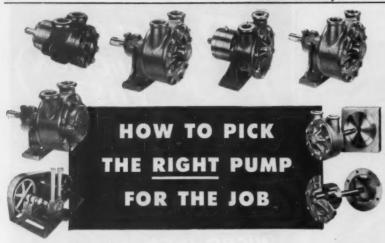
0



PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED





TUTHILL Simplifies Pump Selection for PRODUCT DESIGNERS

To make it easy for product designers to select the right oil pump for the job, Tuthill offers new catalog data covering pump models to meet the specific pumping purposes outlined below. Each

catalog features an individual pump guide so you can select the exact pump to fit your need. Check the following services and ask for the Tuthill catalogs you wish by Catalog number indicated.

For PRESSURE LUBRICATION

Model L	1/2 to 6 g.p.m. up to 200 p.s.i	101
Model C	2 to 200 g.p.m. up to 100 p.s.i	102
Model R	3/4 to 200 g.p.m. up to 100 p.s.i	105
Models S & SA	1/2 to 200 g.p.m. up to 200 p.s.i	106

For HYDRAULIC SERVICE

	the state of the s	Catalog	No
Model L	1/2 to 6 g.p.m. up to 600 p.s.i	101	
Model CK	5 to 200 g.p.m. up to 400 p.s.i	103	
Model R	% to 200 g.p.m. up to 400 p.s.i	105	
Models S & SA	1/3 to 200 g.p.m. up to 200 p.s.i	106	

For COOLANT SERVICE

Model C	2 to 200 g.p.m. up to 100 p.s.i	Catalog 102	
Model CK	100 to 200 g.p.m. up to 200 p.s.i	103	
Model M	2 to 50 g.p.m. up to 15 p.s.i	104	
Model R	2 to 200 g.p.m. up to 100 p.s.i	105	
Models S & SA	2 to 200 g.p.m. up to 200 p.s.i	106	

For TRANSFER AND CIRCULATING

		Catalog	No
Model L	1/2 to 6 g.p.m. up to 200 p.s.i	101	
Model C	2 to 200 g.p.m. up to 100 p.s.l	102	
Model CK	100 to 200 g.p.m. up to 200 p.s.i	103	
Model R	2 to 200 g.p.m. up to 100 p.s.i	105	
Models S & SA	2 to 200 g.p.m. up to 100 p.s.i	106	

For BURNING OILS

		Catalog No.
Model L	1/3 to 6 g.p.m. up to 200 p.s.i	101
Model C	2 to 50 g.p.m. up to 100 p.s.i	
Type SU	2 to 50 g.p.m. up to 300 p.s.i	107

For BUILT-IN APPLICATIONS

All standard Tuthill Pump models are available in stripped form for building into the design of your equipment. Ask for Catalog No. 106.

TUTHILL PUMP COMPANY

939 East 95th Street, Chicago 19, Illinois





RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

REELS, Stock, Standard and Automatic

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORS, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa. Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, General Electric Co., Schenectady, N. Y.

Bethlehem Steel Co., Bethlehem, Pa. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. Morgan Engrg. Co., Alliance, Ohio.

RIVETERS, Pneumatic

Chicago Paephanic Tool Co., 6 E. 44th St., New York, N. Y. Grant Mfg. & Machine Co., 90 Silliman St., Bridegport 5, Conn. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Wood & Co., R. D., Public Ledger Bldg., Phila-delphia, Pa.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. N.Y. Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. National Machinery Co., Greenfield and Stan-ton Sts., Tiffin, Ohio.

P.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.
(Continued on page 414)

VICKERS ... the MOST EXTENSIVE LINE

of hydraulic units complying with JIC STANDARDS

Shown here are only a few representative standard Vickers units that comply with JIC Standards . . . standards that are directed toward ease of maintenance, safety, longer life and uninterrupted machine production. "Undivided Responsibility" is another important advantage gained by specifying Vickers Units throughout a hydraulic system. For further information ask for new Bulletin 5002.



Two Stage Vane Pump (2000 psi)





Variable Delivery Piston Type Pump











Type Counterbalance Valve

h Hydrostatic



Manually Operated Four-Way Valve



Pilot Operated Four-Way Valve





Solenoid Controlled Pilot Operated Four-Way Valve















WRITE for your copy

Vickers Circuitool consists of a handy, transparent plastic guide and a 24-page manual to speed the drawing and to promote symbol (JIC) uniformity of hydraulic circuits.

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

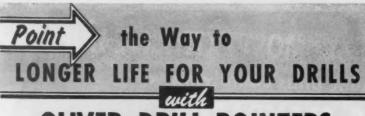
1403 OAKMAN BLVD. . DETROIT 32, MICH.

Application Engineering Offices:

Application Engineering Orrices:

ATLANTA ° CHICAGO AREA (Brookfleid) ° CINCINNATI
CLEVELAND ° DETROIT ° HOUSTON ° LOS ANGELES AREA
(El Segundo) ° NEW YORK AREA (Summi), N. J. ° PHILADELPHIA AREA (Media) ° PITTSBURGH AREA (Mr. Lebanon)
ROCHESTER ° ROCKFORD ° SAN FRANCISCO AREA
(Berkeley) ° SEATTLE ° TULSA ° WASHINGTON ° WORCESTER

AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921 ENGINEERS



Twist drills machine-ground the Oliver Way not only last up to 3 times longer than hand-ground drills but also cut faster and more accurately.



doing equal work. This great accomplishment is due to a unique OLIVER feature - the ability to give you the

MODEL #510

only scientifically correct and theoretically perfect drill point.

Longer wearing life for drills assures economy and efficiency. Remove your drills at the first sign of dullness . . . machine-grind them with OLIVER DRILL POINTERS and -

- Eliminate imperfect holes and rejects.
- Minimize drill costs.
- Maintain production schedules with assurance.

No. 510 for drills 14" to 3"-2-3-4 flute. Variable clearances. Variable point angles. Automatic operation.

No. 21 Oliver Bench Grinder. Hand operated for Drills No. 57 to 1/2". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet
"How To Produce More Holes With Your Drills!" See our catalog in Sweet's Directory

1410 E. MAUMEE . ADRIAN, MICHIGAN PACE MILL GRINDERS

MACHINE TOOLS by OLIVER include:

AUTOMATIC DRILL GRINDERS TOOL & CUTTER GRINDERS DRILL POINT THINNERS TEMPLATE TOOL GRINDERS

RUST PREVENTIVES

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philiadelphia, Pa. Oakite Products, Inc., 19 Rector St., New York, N.Y. George, Co., Inc., 200 Lafayette 51., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment

SANDERS

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich. Millers Falls Co., Greenfield, Mass. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

SAW BLADES, Hock

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III.
Atkins Saw Div., Borg-Warner Corp., 402 S. Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg Mass. burg, Mass. Starrett, The L. S. Co., Athol, Mass.

SAW SHARPENING MACHINES

Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa. Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio. Sherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphia, Pa.
Motch & Merry

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, III. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

SAWING MACHINES, Metal Cutting

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Grob, Inc., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitch-burn Mrs. burg Mass.
Walker-Turner Div., Kearney & Trecker Corp.,
South Ave., Plainfield, N. J.

ð

SAWING MACHINES, Power Hack

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III. Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y. Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y. Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, III.

(Continued on page 416)



TAPS by CARD

The best way to gauge the value of a tap is to try it. You'll find Card taps live up to their reputation every time.



Completely stocked offices at Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS . DIVISION OF UNION TWIST DRILL CO. (ARD) TAPS . DIES . SCREW PLATES



For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-415

SAWS, Circular Metal Cutting

SAWS, Circular Metal Cutting

Atkins Saw Div., Borg-Warner Corp., 402 S.

Illinois St., Indianapolis 9, Ind.

Brown & Sharpe Mfg. Co., Providence, R. I.

Consolidated Mch. Tool Corp., Rochester, N. Y.

DoAll Co., 254 Laurel Ave., Des Plaines, III.

Johnson Mfg. Co., Albion, Mich.

Espen-Lucas Machine Works, Front St. and

Girard Ave., Philadelphia, Pa.

Gorham Tool Co., 14400 Woodrow Wilson,

Detroit, Mich.

Motch & Merryweather Mchry. Co., Penton

Bldg., Cleveland, Ohio.

National Twist Drill & Tool Co., & Winter Bros.,

& Co., Rochester, Mich.

Simonds Saw & Steel Co., 470 Main St., Fitch
burg, Mass.

Union Twist Drill Co., Athol, Mass.

Walker-Turner Div., Kearney & Trecker Corp.,

900 North Ave., Plainfield, N. J.

SAWS, Metal Cutting Band

Away, Metal Lutting Band
Armstrong-Blum Mfg, Co., 5700 W. Bloomingdale Ave., Chicago, III.
Atkins Saw Div., Borg-Warner Corp., 402 S.
Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co.
614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Johnson Mfg. Co., Albion, Mic.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass. burg, Mass. S., Co., Athol, Mass. Starreft, The L. S., Co., Athol, Mass. Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Portable Electric

Black & Decker Mfg. Co., Penna. Ave., Tow-son, Md. Millers Falls Co., Greenfield, Mass.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass. Starrett, The L. S., Co., Athol, Mass. Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III.

SCREW DRIVERS, Power

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich.

SCREW DRIVING AND NUT SETTING EQUIPMENT

Black & Decker Mfg. Co., E. Penna. Ave., Tow-son, Md. Errington Mechanical Laboratory, Inc., 24 Nor-wood Ave., Stapleton, S. I., N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Keller Tool Co., Grand Haven, Mich.

SCREW MACHINE TOOLS

Bardons & Oliver, Inc., Ft. W. 9th St., Cleve-land 13, Ohio.

Brown & Sharpe Mfg. Co., Providence, R. I.
Colonial Broach Co., P. O. Box 37, Harper Sta.,
Detroit 13, Mich.
Gisholf Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia
Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland.
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Con.,
Potter & Johnston Co., 1027 Newport Ave.,
Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia
40, Pa.
Reed Rolled Thread Die Co., P. O. Box 350,
Worcester 1, Mass.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

SCREW MACHINE WORK

Eastern Mch. Screw Corp., New Haven, Conn. Mueller Brass Co., Port Huron 35, Mich. National Acme Co., 170 E. 131st St., Cleveland.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mg. Co., Providence, R. I. Cone Automatic Mch. Co., Inc., Windsor, Vt. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wisc.
Greenlee Bros. & Co., 12th and Columbia
Aves., Rockford, Ill.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Varner & Swasev Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

SCREW MACHINES, Hand

See also Lathes, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholf Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira,
N. Y. N.Y.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway,
Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Prott & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co. Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allmetal Scerw Products Co., Inc., 821 Stewart
Ave., Garden City, N. Y. (Stainless Steel oniy.)
Chicago Screw Co., Bellwood, III.
Chicago Screw Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bidg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Standard Pressed Steel Co., Jenkintown, Pa. 2

(Continued on page 418)

improved delivery



OF GRAND RAPIDS UNIVERSAL CUTTER AND TOOL GRINDERS

It's true, they have been hard to get because every model offers extra value.

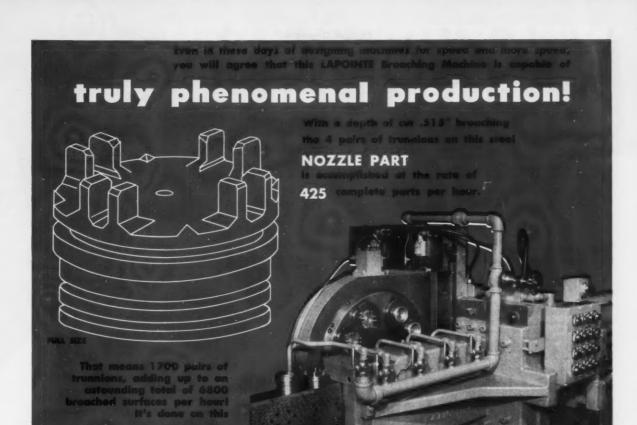
The Model 62, for instance, features four-speed spindle drive, universal positioning of elevating hand wheel, anti-friction ways, more vertical capacity, longer swing, one-shot lubrication system.

The many other Grand Rapids Cutter Grinders are also on improved delivery schedules. Send coupon for complete information.

Get the full story on all the advantages

	& LIVINGSTON CO.
425 Straight	Ave., Grand Rapids, Mich
-	e the following literature with
out obligation	
	Grinder Literature
Surface Grin	
_ sorrace orni	THE STEEL ST
NAME	wer siterature
	net initiative
NAME	Net Elleratore
NAME POSITION	NOT STORAGE





HP 40 HORIZONTAL 90" STROKE

Hydraulic BROACHING MACHINE

automatic operations!

Clamping and unclamping of parts, advance into broaching position, retraction for the return, and rotation into successive locked positions are all automatic . . . with full electrical interlock . . . so the operator's chief duty is to unload and reload parts! The efficient LAPOINTE-built fixture has a rotor mounted on a horizontal axis with 4 pairs of part nests spaced 90° apart. Parts are loaded in pairs. As the rotor turns into position 45° ahead of vertical it is plunger-locked for the initial cut, broaching the parallel surfaces of two pairs of trunnions in a single pass. Subsequent locking occurs when the rotor has automatically indexed to 45° beyond vertical where the second broaching cut is made at right angles to the first.



Complete specifications are

2



THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND ENGREES

SCREWS, Self-tapping, Drive

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel Ave., Garden City, N. Y. (Stainless Steel only.)
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.

SCREWS, Thumb

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel Ave., Garden City, N. Y. (Stainless Steel only.)
Parker-Kalon Div., General American Transportation Corp., 200 Varrick St., New York, N. Y. Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SEALS AND RETAINERS, Oil or Grease Crane Packing Co., 1800 Cuyler Ave., Chicago, Garlock Packing Co., Palmyra, N. Y.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio. Miles Machinery Co., Box 770, Saginaw, Mich. Morey Machinery Co., Inc., 383 Lafayette St., New York, N. Y. Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y. The Sharples Corp., 2300 Westmoreland St., Philadelphia 40, Pa.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, III. National Acme Co., 170 E. 131st St., Cleveland, The Sharples Corp., 2300 Westmoreland St., Philadelphia 40, Pa.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Republic Steel Corp., Union Drawn Steel Div.,
Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa. Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Hollow-Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
National Forge & Ordnance Co., Irvine, Warren
County, Pa.
Republic Steel Corp., Union Drawn Steel Div.,
Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III.

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

SHAPERS

SHAPERS

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.

Smith & Mills Shapers, Inc., Div. Hamilton-Thomas Corp., Hamilton, Q.

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

SHAPERS, Vertical

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rockford, Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Structural

Bethlehem Steel Co., Bethlehem, Pa. U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Morgan Engrg. Co., Alliance, Ohio.
Niagaro Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co.,
Inc., Roselle, N. J.
Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2,

SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio. Bliss, E. W., Co., 1375 Katt Ray, S.
Ohio.
Brown & Sharpe Mfg., Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main
St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio. Columbia Div., Lodge & Shipley Co., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Simonds Saw & Steel Co. (Blades), 470 Main
St., Fitchburg, Mass.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.

SHEET METALS

American Brass Co., 25 Broadway, New York, N. Y. Bethlehem Steel Co., Bethlehem, Pa. New Jersey Zinc Co., 160 Front St., New York, N. Y. Republic Steel Corp., Republic Bldg., Cleveland Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Ce., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES SLEEVES
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
National Twist Drill & Tool Co., Rochester,
Mich Mich.

Mich.

Prott & Whitney, West Hartford 1, Conn.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Lobdell United Co., 2000 "G", St., Wilmington 99, Del. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Chicago-Latrobe Twist Drill Wks. 411 W. Ontario St., Chicago, III. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Greenfield Tap & Die Corp., Greenfield, Mass. National Twist Drill & Tool Co., Rochester, Mirch. Michol Twist Drill & Tool Co., Rochester, Mich. Pratt & Whitney, West Hartford 1, Conn. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, Ill. Union Twist Drill Co., Athol, Mass. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SPECIAL MACHINERY AND TOOLS

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Axelson Mfg. Co., P. O. Box 15335, Verona Sta., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baker Bros., Inc., Sto. F., P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut. Rackford. III Olio.

10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St.,
Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring
Garden St., Philadelphia, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge,
Mass.
Biss, E. W. Co., 1375 Raff Rd., S. W., Canton,
Ohio.
Buhr Mch. Tool Co., 835 Green St. Ann Achae. Ohio.

Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.

Chambersburg Engrg. Co., Chambersburg, Pa.

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.

Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y.

Coulter, James, Machine Co., Bridgeport 5, Conn.

Cross Co., Detroit, Mich.

Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.

(Continued on page 420) (Continued on page 420)

HERE IS YOUR NEW 15TH EDITION

MACHINERY'S HANDBOOK
has been the indispensable reference work for designers and builders of
mechanical products. Now the new 15th Edition
gives you the most authoritative information
on present-day designing, manufacturing
and metalworking practices.

Have you ordered your copy?
Send for MACHINERY'S HANDBOOK under our Five-Day Free
Inspection Plan. Examine it;
study it; use it . . . and if you
are not convinced that it is the
most useful, convenient and
comprehensive handbook you
have ever seen, you may return
it without any obligation. Use
the convenient coupon to order
your copy of MACHINERY'S
HANDBOOK today.

This offer applies in U. S. only. See coupon for Canadian or overseas offers.

THE INDUSTRIAL PRESS, 148 LAFAYETTE ST., NEW YORK 13, N. Y.

Please send me a copy of the 15th Edition of MACHINERY'S HANDBOOK, postpaid.

☐ I enclose check or money order for payment in full. (\$9.00 in U. S.; \$10.00 in Canada or overseas)

1911 PAGES \$9.00 POSTPAID IN U.S.

- ☐ I enclose \$3.00 initial payment and will pay balance in two monthly installments. (This offer for U. S. and Canada only)
- □ Send Handbook under Five-Day Free Inspection Plan. If I decide to keep the Handbook I will send:
 □ \$9.00 payment in full, or □ \$3.00 initial installment within five days. (U. S. only)

Name

Company

Address

City Zone State

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Spring-field, Vt.
Fischer Machine Co., 310 No. 11th St., Philadelphia, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves., Rackford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Hartford Special Mschry, Co., 287 Homestand Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland 2. Ohio.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
John B., Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Frie Engrg. Corp., Kenmore Station, Buffalo, N. Y. Lake Erie Engrg. Corp., Kenmore Station, Burfalo, N. Y.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Michigan Tool Co., 7171 E. McNicholas Rd., Detroit 12, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4. Mich. Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich., Moline Tool Co., 102 20th St., Moline, III., Morgan Engrg. Co., Alliance, Ohio., Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio., Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio., National Acme Co., 170 E. 131st St., Cleveland, Ohio., National Automatic Tool Co., Inc., 5 7th and National Automatic Tool Co., Inc., 5 7th and

National Automatic Tool Co., Inc., S 7th and

N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean-Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

National Twist Drill & Tool Co., Rochester, Mich.

New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.

Praft & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Seneca Falls Mch. Co., Seneca Falls, N. Y.

Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

Taft-Peirce Mfg. Co., Woonsocket, R. I.

Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

Union Twist Drill Co., Athol, Mass.

Universal Engrg. Co., Frankenmuth 2, Mich.

Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

Waltham Machine Works, Newton St., Waltham Mass.

Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio. National Twist Drill & Tool Co., Rochester,

SPEED REDUCERS

SPEED REDUCERS

Boston Gear Work, 320 Main St., North Quincy
71, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave.,
Cicero 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland, Ohio.
Cone-Drive Gears,
7171 E. McNichols Rd., Detroit 12, Mich.,
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia,
Conn.
General Electric Co., Schenectady, N. Y.
Link-Belt Co., 2045 W. Huntington Park Ave.,
Philadelphia 40, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Wis.
Perkins Machine & Gear Co., West Springfield, Perkins Machine & Gear Co., West Springfield, Mass. Mass. Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa. Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Pope Mchry. Corp., Haverhill, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass. Link-Belt Co., 220 S. Belmont Ave., Indian-apolis 6, Ind. Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indiangolis 6, Ind.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, Sheet Metal

Laminated Shim Co., Inc., Glenbrook, Conn. Republic Steel Corp., Niles Steel Products Div., Republic Bidg., Cleveland 1, Ohio. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Crucible Steel Co., Reading, Pa. Crucible Steel Co., Reading, Pa. Crucible Steel Co., of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. National Forge & Ordnance Co., Irvine, Warren County, Pa. Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Corp., 470 Main St., Fitchburg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Concumbia Steel Corp., Div., Tennessee Coal, Iron & R. R. Co., Div., 1919, V. S. Steel Corp., Oliv., Concumbia Steel Corp., 1919, V. S. Steel Supply Div., U. S. Steel Cop., 208 S. LaSalle t., Chicago 4, Ill.
Wheeler-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Oliver Bldg.
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Republic Steel Corp., Union Drawn Steel Div.,
Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co.,
Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

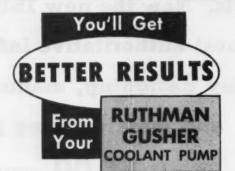
STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(Continued on page 422)



ILLUSTRATED IS A WESTERN No. 3-12 UPRIGHT DRILL EQUIPPED WITH A GUSHER COOLANT PUMP. MODEL 3-P3.



because **RUTHMAN** makes a better pump

Don't take our word for it. We'll be glad to show you our long list of satisfied users, machine tool manufacturers that have used Gusher Coolant Pumps as standard equipment on their machines for ten, twenty, thirty years. Honestly, it reads like a blue book of the leading machine tool manufacturers. Follow the leaders. Specify Ruthman Gusher Coolant Pumps for all your metal cutting machinery.



THE RUTHMAN 1807 Reading Road



BEVEL GEARS—BEVEL PINIONS with



BILGRAM!

Long stemmed bevel gears and bevel pinions of almost any length! Here's a special kind of gear work that requires extensive know-how and the right kind of equipment in order to produce gears that will give dependable performance and meet your ideas of precision and price.

We are equipped—both with the machines and the skill—to produce gears for your every requirement: Bevels of all kinds . . . Ellipticals . . . Herringbones . . . Helicals . . . Racks . . . Spurs . . . Hypoids . . . Worms and Worm Gears. Get a BILGRAM estimate on your next job and be convinced!



FOR ALL YOUR GEAR NEEDS

BILGRAM

GEAR & MACHINE WORKS

Manufacturers of Bevel Gear Generators and Chamfering Machines 1217-35 SPRING GARDEN ST.

PHILADELPHIA 23, PA.



Columbus Die-Tool

Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.



Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio. Ryersen, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass. Vanadium Alloys Steel Co., Latrobe, Pa. Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

STEEL, Machine
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland
I, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 88, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Fa. Carpenter Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio. Republic 1, Ohio 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div.), 436
7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel

Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland
I, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
U. S. Steel Corp. (American Steel & Wire Co.
Div., Carnagie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron
& R. R. Co. Div.), 436 7th Ave., Pittsburgh,
Pa.

STEEL, Tool and Die

STEEL, Tool and Die
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland
1, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel

STEEL BARS

See Bars, Steel

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I. Starrett, The L. S., Co., Athol, Mass.



Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N.Y.

STOCK STOPS

Wohlnip Engineering Co., 390 Hillside Ave., Hillside, N. J.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass. Greenfield Tap & Die Corp., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Threadwell Tap & Die Co., Greenfield, Mass.

STONES, Oil or Sharpening

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Norton Co., I New Bond St., Worcester 6, Mass.

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass Taft-Peirce Mfg. Co., Woonsocket, I

STRAIGHTENERS, Flat Stock and Wire

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.

Chambersburg Engrg. Co., Chambersburg, Pa.

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.

Consolidated Mch. Tool Corp., Rochester, N. Y.

Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

STUD SETTERS

Errington Mechanical Laboratory Inc., 24 Nor-wood Ave., Stapleton, S. I., N. Y. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES

See Plates, Surface

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Torrington Co., Torrington, Conn.

(Continued on page 424)



Everyone recognizes this as a sign of Thanksgiving . . .

And smart gear users know this sunisis the sign of the best in custom made gears.

May We Send You Our Brochure?



"Gears... Good Gears Only"

THE CINCINNATI GEAR CO. . CINCINNATI 27, OHIO



Triples brush life CAN AN OBA CUT YOUR COSTS?





Moster of many jobs. Because it can do so many different jobs, the Master Wheel is one of Osborn's most popular wire brush wheels. It is used extensively for finishing, cleaning, burr and scale removal. Here, it is being used at 3000 rpm to remove scale from a heat-treated part.

THE wire brush wheels formerly used for coating this pipe with concrete lasted a maximum of 115 pipe lengths. Now, Osborn Master® Wheels coat 350 pipe lengths—a 3 to 1 superiority in service life. Longer brush life is typical of results obtained by an Osborn Brushing Analysis.

Whether your operation is a special job like coating concrete ... or any cleaning, finishing or burr removal applications, an OBA could help cut your costs. Have an Osborn Brushing Specialist analyze your operations and submit a confidential written report to you on how you can benefit with power brushing. An OBA costs you nothing. Call or write The Osborn Manufacturing Company, Dept. D-23, 5401 Hamilton Avenue, Cleveland 14, Ohio.

Osborn Brushing Analysis

TO HELP YOU DISCOVER HIGHER QUALITY AND LOWER COSTS WITH POWER BRUSHING

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-423

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis. Wis. General Electric Co., Schenectady, N. Y. National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

TACHOMETERS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

TANGS, Replaceable, Drill & Reamer

Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

TAPER PINS, Standard

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel Ave., only.) only.) Chicago Screw Co., Bellwood, III. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Gillen, John, Co., Inc., 2540 S. 50th Ave., Cicero 50, III. Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Col. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Errington Mechanical Laboratory, Inc., 24 Nor-wood Ave., Stapleton, S. I., N. Y. McCrosky Tool Co., 1938 Thomas St., Mead-ville, Pa. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, III. Chicago, III. Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.

TAPPING ATTACHMENTS AND DEVICES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Eltco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N.;
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 70, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn. Conn. Buffalo Forge Co., 490 Broadway, Buffalo, Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Challenge Mchry. Co., Grand Haven, Mich. Cleveland Tapping Machine Co., Canton 6, Ohio. Cleveland Tapping Machine Co., Cannot Nohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa., 121 East Luray St., Philadelphia Pros. & Co., 12th and Columbia Aves., Rockford, III.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2. Ohio.

Hirschmann Co., Carl, 30 Park Ave., Manhosset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St.,
Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield, Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio. National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. 5ts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swarey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio. Snow Mfg. Co., 435 Eastern Ave., Bellwood, III. -3

1

TAPS

TAPS
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
Datroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn. Landis Mch. Co., Waynesboro, Pa. National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

TESTING EQUIPMENT, Tension, Compression, Fatigue, etc.

Olsen Tinius, Testing Machine Co., Philadelphia, Pa.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Coulter, James, Machine Co., Bridgeport 5,
Conn.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mtg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hanson-Whitney Co., Div. Whitney Chain Co.,
Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Ohio. Ohio.

Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford I, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St.,
Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Pierce Mfg., Co., Woonsocket, R. I.

(Continued on page 426)

Write for catalog or engineering help on any duplicating problem Ly Lehigh Foundries, Inc. CONTROL

1507 LEHIGH DRIVE, EASTON, PA. Manufacturers of LEHIGH Air Valves . Air Cylinders . Air Hoists . Air Motors West Coast Dist.: CAMPBELL CONTOUR ATTACHMENT CO., 1320 W. Esther St., Long Beach, Cal.



DIVISION



THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, III.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Prott & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread. See Grinding Machines, Thread

THREAD GRINDING MACHINES

THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Pratt & Whitney, West Hartford 1, Conn. Waltham Machine Works, Newton St., Wal-tham, Mass.

THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

THREAD ROLLING MACHINES

Landis Machine Co., Waynesboro, Pa. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Con. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Obio. Ohio.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa. Republic Steel Corp., Republic Bldg., Cleveland J. Ohio.

S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa. 15

TOOL BITS, High Speed Steel

TOOL BITS, High Speed Steel
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, III.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co., Reading, Pa.
Crucible Steel Co., of America, Oliver Bidg.,
Pittsburgh 30, Pa.
DoAII Co., 254 N. Laurel Ave., Des Plaines, III.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago I8, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Vanadium Alloys Steel Co., Larboe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Moss.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
7, N. Y.

TOOL BITS, Special Alloy

TOOL BITS, Special Alloy
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planning Tools.

TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.

Michigan Tool Co., 7171 E. McNichols Rd., Defroit, Mich.

Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 17, Ohio.

and L. Tools, 1825 Bristol St., Philadelphia 40, Pa.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)

(Continued on page 428)



AIR OPERATED FRICTION CLUTCH

Guards removed to show air-operated electrically controlled friction clutch. New interconnected single-point adjustable brake mounted on reverse side of gear. Designed originally for one of the largest automotive manufacturers in the country, this press will have wide application in many industries. Highly versatile in punching, forming, blanking, 11" adjustable bed. J.I.C.Nema 12 control panel.



Write for Complete Specifications

MACHINE COMPANY

Bridgeton, New Jersey, U.S.A.

Manufacturers of Power Presses, Press Brakes and Special Machinery



Specialty Manufacturer chooses

PRESS-RITE
POWER PRESSES

for:
VERSATILITY
PRODUCTION
and low
MAINTENANCE



is yours for the asking. Simply send a print or details of your requirements and our experienced press engineers will gladly make recommendations that will help you get the results you desire.

SERVICE

Brown & Bigelow, advertising

specialties manufacturer, a long time user of PRESS-RITES has this 30 ton PRESS-RITE Press in their East Hennepin Plant, Minneapolis, Minn. In addition to high production, versatility is the key word. A variable speed drive provides 44 to 164 strokes per minute making the PRESS-RITE ideally suited to many jobs and many operators. Specialty items require materials from .035 x 3½" cold roll steel coil to .014 x 5½" enameled stripping, and regardless of the job, production is high, rejects are low, and operating costs and maintenance are kept at a minimum. You too can benefit from the efficiency and the economy of PRESS-RITE presses. There is a complete line from 5 to 85 ton capacity . . . in 9 standard models.

Sales Service Machine Tool Co.

2351 UNIVERSITY AVENUE . ST. PAUL 4, MINNESOTA



Send for This Useful Catalog



With technical books you can get the right answer-quickly and easily—to many of your daily problems. This useful catalog gives a detailed description, including a complete outline of contents, of every book published by The Industrial Press-MACHINERY'S Handbook, Machine Shop Training Course, Die Design, Gear Design, Engineering Encyclopedia and many others. Also explains how you may order these books through our convenient monthly payment plan. Just mail the coupon below, and we'll send your copy by return mail.

MAIL THIS COUPON TODAY!

THE INDUSTRIAL PRESS		11/54	
148 Lafayette St., New York	13, N. Y.		
Please send a copy of your b below.	ook catalog	to the address	5
Name(Please Print Nam	e and Address)		
Company			
Position			
Street and No			
City	Zone	State	

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

TOOLS, Carbide-Tipped
Alleghany Ludlum Steel Corp., Pittsburgh, Pa. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Tirth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich. Gairing Tool Co., 21223 32, Mich. Gorham Tool Co., 14400 Woodrow Wilson, 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadviille, Pa.,
Metal Carbides Corp., Youngstown, Ohio.
Newcomer Products, Latrobe, Pa.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich. Newconer Trouts, Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Union Twist Drill Co., Athol, Mass. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

TOOLS, Lathe, Shaper and Planer
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St.,
Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, III.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box
237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Holpern, Wm., Co., Inc., 100 Stevens Ave.,
Mt. Vernon, N. Y.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit
13, Mich.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffolo
7, N. Y.

TRANSFER MACHINES, Automatic

Baird Machine Co., 1700 Stratford Ave., Strat-ford Conn.

(Continued on page 430)

1200 TON PRESS

These are the features
that make Verson
presses your best buy

Extra long, adjustable, square gibbing of

Verson-

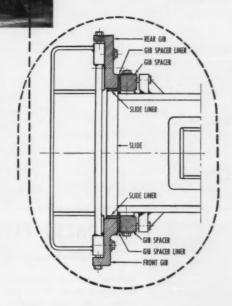
Presses
assures
accuracy
and long
press
and tool life

Quality has to be designed and built into a press—it can't get there by accident. A good example is the gibbing of Verson presses. It is extra long to provide accurate guidance of the slide right to left and front to back throughout the stroke. It is adjustable in both directions to make it possible to maintain precise accuracy at all times. To assure peak efficiency at all times, gib bearing surfaces are ground to a mirror finish.

59

For the user, the design of Verson gibbing means better press performance and longer life for both press and tooling. It all adds up to better stampings at lower overall cost.

Put this advantage and Verson's many other advantages to work in your plant. Whether you require a single press or an entire stamping plant, complete with tooling, we'll be pleased to make recommendations.



A Verson Press for every job from 60 tons up.



ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9309 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS . SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES . TRANSMAT PRESSES . TOOLING . DIE CUSHIONS . VERSON-WHEELON HYDRAULIC PRESSES.

For more information on products advertised, use Inquiry Card, page 265

MACHINERY, November, 1954-429

Barnes Drill Co., 814 Chestnut St., Rockford, III.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Col-nial Broach Co., P. O. Box 37, Harper
Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N.Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa. Oligaar Co., 1569 W. Pierce St., Milwaukee, Wis. Wis. Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridge-port 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, III. Yoder Co., 550 Walworth Ave., Cleveland.

TUBE MILLS

Abbey-Etna Co., 2422 Maplewood Ave., Toledo 10, Ohio.

TUBES, Electronic

Electrons, Inc., 127 Sussex Ave., Newark 3, N. J.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y. N. Y. Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Grass Co., 25 Broadway, New York, N. Y.

TUBING, Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa.

National Tube Div. U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa. Republic Steel Corp., Steel & Tubes Div., Re-public Bldg., Cleveland 1, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS

Sce Drills, Twist

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass. Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.

VALVE CONTROLS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

VALVES, Air

Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St.,
Salem, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr.,
Eoston, Pa.
Rivett Lathe & Grinder Inc., Brighton, Boston
35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate,
Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, III.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Honnifin Corp., 501 S. Wolf Rd., Des Plaines, III. Hannitin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1400 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co.,

Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, Ill.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Brown & Sharpe Mfg. Co., Providence, R. I,

Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh B, Pa.

Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill. III.
Logansports Machine Co., Inc., 810 Center
Ave., Logansport, Ind.
Prioducto Mch. Co., 990 Housatonic Ave.,
Bridageport, Conn.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
South Bend, Ind.
Universal Engineering Co., Frankenmuth 2,
Mich.
U. S. Burke Machine Tool Div., Brotherton Rd.
17, Cincinnati 27, Ohio.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N.Y.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Shaper Co., Elan and Garrard Aves., Cincinnati, Ohio. Cincinnati, Ohio. Rockford, III. Skinner Chuck Co., 344 Church St., New Britain, Conn. Suth Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VOLTMETERS

General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WASHERS, Spring

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only.) Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

(Continued on page 432)



HARDNESS TESTING

Brinell-Shore-Scale

Included in our improved Portable Scleroscope Model D-1. This efficient single scale tester registers Brinell-Shore values without damage to the work. The old standby for forty-three

WRITE FOR CIRCULAR

THE SHORE INSTRUMENT & MANUFACTURING CO., INC. 90-35 Van Wyck Expressway, Jamaica, 35, H.Y.





For more information on products advertised, use Inquiry Card, page 265

Saves \$11,549 a year with one DENISON MULTIPRESS®

...all on a \$3,000 investment. At Penn Controls, Inc., the former method of staking or riveting with a mechanical press was too slow . . . actually scrapped 376 pieces a day due to variations in size of components.

Now, women operators simply load the six parts of the magnetic switch onto the index table of a 4-ton Denison Multipress. With one smooth hydraulic stroke of the Multipress ram, parts are accurately staked together . . . saving \$7,345 a year on scrap reduction alone.

With the same labor, Multipress has nearly doubled production.

Staking is one of hundreds of different jobs performed by the Denison hydraulic Multipress. For bulletins and case studies of applications in the 1 to 75-ton pressure range, write to:

THE
DENISON ENGINEERING COMPANY
1244 Dublin Road • Columbus 16, Ohio





MACHINERY, November, 1954-431

WELDING AND CUTTING EQUIPMENT

Oxyacetylene Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Delta Power Tool Div., Rockwell Mfg. Co., 6146 N. Lexington Ave., Pittsburgh 8, Pa. Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich. General Electric Co., Schenectady, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W. Chicago, III. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich. Federal Machine & Welder Co., Warren, Ohio.

WELDMENTS

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Mahon, R. C., Co., Detroit 34, Mich. Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill. Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIPERS

Scott Paper Co., Chester, Pa.

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio. U. S. Steel Corp., (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

WIRE

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio. National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

(1

10

WOODWORKING MACHINERY

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Frew Machine Co., 121 East Luray St., Philodelphia 20, Pa. Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, III.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III.
Valker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio. Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa. Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Ingersoll-Rand Co. (Impact, Pneumatic, Elec-tric), Phillipsburg, N. J. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave. Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

WRENCHES, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Keller Tool Co., Grand Haven, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Top

Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill
Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

ing and chamfering.

New Jersey Zinc Co., 160 Front St., New York, N. Y.

In Defense or Peace ECLIPSE Specials

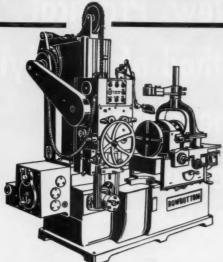


Since 1913—through two wars and during the peace years—Eclipse has met the exacting and changing demands of industry for special purpose end cutting tools. What better test? What better recommendation? Our large modern plant can serve you, too. Send your problem to us, today!



in oil pump.

ROWBOTTOM CAM MILLERS and GRINDERS



. . . for fast, economical production of cams of all types and sizes

By taking advantage of Rowbottom's long, specialized experience in the design and production of cam-making machines, you can be certain of the most modern and efficient equipment for handling your needs.

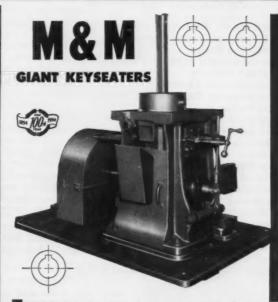
Rowbottom machines include cam millers for milling box, barrel and face cams in sizes up to 32" OD; also cam grinders of the same capacity. An 8-page bulletin describes Rowbottom machines in detail and illustrates a few of the many types of cams being produced regularly on these machines.

If you use cams in the assembly of your equipment, it will be to your advantage to have Rowbottom survey your requirements and ascertain how you can most economically handle your needs . . . whether it will pay you to install machines or have Rowbottom produce your cams and thereby serve as your cam-making department. A study of your needs will provide the answer you are looking for. Get in touch with us now.

Whatever your needs, send us drawings and specifications for our prompt analysis, stating quantity required.

-POUDOTTOM MACHINE CO. WATERBURY CONN.



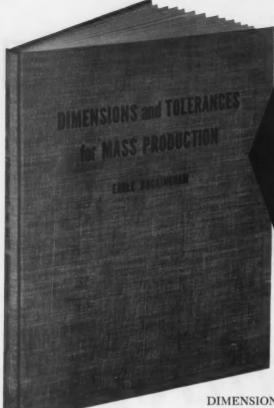


M & M Giant Keyseaters, built in a wide range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems today.

MITTS & MERRILL

68

64 Holden Street . SAGINAW, MICHIGAN



A New, Practical Method of Specifying Dimensions and Tolerances

Would you specify a dimension with a tolerance if there were no practical way to measure it? Ridiculous as this appears, it *can* happen!

DIMENSIONS AND TOLERANCES FOR MASS PRODUCTION presents a new, practical approach to the problem of dimensioning with tolerances in relation to: production design, tool design, gage design, production and inspection. It suggests definite methods and practices that would eliminate many of the uncertainties in present-day practice.

The author, Earle Buckingham, is an outstanding authority on interchangeable manufacture. He says, "The only logical and defendable interpretation of tolerances is that the limiting dimensions on the detail drawing represent the requirements of inspection gages. In other words, it must be possible to translate every limiting dimension into a definite design and size of an inspection gage. Limiting dimensions on detail drawings are needed to control the following: (a) conditions of bulk or size, (b) conditions of form, (c) conditions of position, (d) conditions of assembly operation or functioning.

"The method used to specify permissible tolerances may need to be different for each of these conditions. Conditions of form or position treated in the same manner as conditions of size lead to chaos."

If you are concerned with any phase of product design or production planning, DIMENSIONS AND TOLERANCES FOR MASS PRODUCTION will give you a new, clearer conception of the problem of expressing dimensions and tolerances in relation to subsequent operations. It will help you develop sounder, more practical procedures, not only in the design stage, but also in manufacturing, inspection and assembly.

Let us send you a copy of this important new book. Just mail the coupon below, and when you have read DIMENSIONS AND TOLERANCES FOR MASS PRODUCTION we are sure you will find it one of the most useful, idea-stimulating books on the subject in your technical library.

CONTENTS Need for an Adequate System for

Dimensioning with Tolerances Production Design Dimensions and Tolerances for the **Detail Drawing** Tolerances on Conditions of Size Tolerances on Conditions of Form -Profiles Tolerances on Conditions of Form -Tapers and Angles Tolerances on Conditions of Posi-Specification by Means of Functional Gages **Specifying Surface Finish** Production Design of 3-Jaw Chuck (illustrative example) Production Design of a 3/4-Inch Globe Valve (illustrative example) Summary

> 178 Pages 8½ x 11 Inches 179 Illustrations

Appendix-Definitions of Terms

\$8.00

Postpaid in U.S. In Canada or overseas, \$8.80

Please send postpaid.	me	а	cop	y	of	•	'Di	im	en	sic	ons	1	ane	1	Tol	er	an	ces		for		M	as	\$ P	ro	dı	uct	io
☐ I enclose c	heck	1 10	non	ey	or	de	r f	or	\$					٠														
Bill me		Bill	my	, ,	OIT	po	any	y.																	9-			
Name																0 0							.0					
irm																									٠.			
irm Address								×																				
ity													Zo	ne				. 5	ita	te								
lome Address						()		050		ii.	in.	if	yeu	w	oni	b				he	om	 e)						
City																												

INTPIONEERS IN RIVETING

OVER 50 YEARS' EXPERIENCE

BOTH SPINNER AND HAMMER TYPES Single and Multiple Spindles-Vertical and Horizontal-Automatically or Foot-Operated, Handles rivets from the smallest and most delicate up to 3/4" diameter.





THE GRANT MFG. & MACHINE CO.

N.W. Station

Bridgeport 5, Conn.



Noiseless

Spinning

Machines

Rivet

ALLEN Punch Press 2-Ton Power Bench Type

Powerful, Dependable, Economical.

r light work—stamping, forming rivet—metal, fiber or other material. nng—metal, fiber or other material.

Overall height 19%" Sass size 9"

8%" Die hed 6%" x 8"

Ram face 1½" x 3½" Sam strek.

34" positive 34" ram adjustment

sturdy, single pin, non-repeat hand
lever elsteh. V-beit drive, weight 105 lbs.

Requires only 1/3 H.P. Motor.

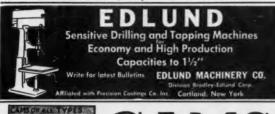
The machine of a thousand uses! Adequate for many types of work now done on large presses at greater expense.

30-Day Money-Back Guarantee. Order TODAY. Price \$97.50 F.O B., Clinton, Mo. (Includes Motor bracket, V-belt, motor pulley, less motor).

ALVA F. ALLEN, Dept. M, Clinton, Mo.

FREE CIRCULAR

Dealer Inquiry Invited





MADE TO YOUR SPEC. EISLER ENGINEERING CO., INC. 736 SO. 13th ST. NEWARK 3, N. J. U.S.A.

OPERATION is made possible by the Davis tilting table, which permits even work tapering as much as 3" per foot to be set up and cut quickly. And Davis multiple tooth cutters make quick work of all keyways up to 1" in width. Let us work out setups to speed up your production. Write for Bulletin COMPANY ROCHESTER 8, N. Y.



BRAKES

For Single and Quantity Runs Bending Steel Plate and Sheet Metal

Special Bending Brakes Double Folder Brakes



MANUFACTURING COMPANY /412 S. Loomis Blvd., Chicago 36, Illino



SAVES TAPS . . . STOPS SPOILAGE

"Controlled Tapping" is the nearest to automatic tapping perfection yet developed! AND users of Procunier tapping heads have been enjoying this advantage for many years. It is made possible by a unique exclusive clutch design which operates with a smooth sensitive "cushioned action." The tap driving power submitted the drill press spindle. Large or dull taps require more pressure and driving power than smaller, sharper ones—and a "green" as well as experienced operators can quickly detect dull or loaded taps by the "feel" or pressure applied. The acute sensitivity of the clutch results in less top breakage, fewer spoiled pieces and makes it easier to maintain high production schedules and output. This is only one of the many exclusive features and advantages that have made Procunier Tapping heads the favorites in the industry. Learn how you, too, can produce more, for less—faster and longer with Procunier.

Write for FREE Brochure

Giving full particulars on the New Tap King and the complete line of Tapping Machines.

PROCUNIER

Safety Chuck Company
16 S. Clinton St. Chicago 6, III.



TRU-GRIF Tap Holder

w TRU-GRIP p Holder is hter, smaller diameter. It

elle

easier



Write for description, specifications and prices

HARVEY MANUFACTURING CORP.
Subsidiary of GERMANOW-SIMON MACHINE CO., Inc.

350 St. Paul St., Rochester 3, N. Y.





SIMPLEX-M ABRASIVE BAND GRINDER

The precision of a machine tool plus the durability of a workhorse. Complete with 1/2 H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES
AND SIZES IN NEW
MANUAL ON FINISHING
WRITE TODAY

WALLS SALES CORP.

GEAR

HOBBING SHAPING GENERATING LAPPING SHAVING

0

WILLIAMSON GEAR & MACHINE CO.
2606 MARTHA ST., PHILADELPHIA 25, PA.
REgont 9-8424

GEARS -ALL MAKES . . . Special and Standard

PRECISION GEARS UP TO 200 DIAMETRAL PITCH

All Gears certified for Accuracy Quality and Fine Workmanship

NEW JERSEY GEAR & MFG. CO. 1470 Chestnut Ave. Hillside, N. J.

by duplex-mounted angular-

contact ball bearings.



This 2500 pound steel spur gear of manganese moly stock, was fabricated by Stahl for tough, exacting service in a steel rolling mill. For all your gear needs, large or small, in any quantity, benefit from Stahl's many years of precision gear manufacture—your inquiry will get prompt attention.

Stahl

BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS
TO 48" PD, 2 DP
CONTINUOUS-TOOTH HERRINGBONE
TO 60" PD, 2 DP
SPROCKETS TO 72" PD, 2½" CP
RACKS TO 20 FF. LONG, 3 DP
SILENT GEARS;
RAWHIDE, BAKELITE, FIBROIL
HEAT-TREATED, CASE OR FLAME
HARDENED GEARS—
OF CARBON OR ALLOY STEEL

SPURS TO 72" PD, 1 DP

GEAR & MACHINE COMPANY 3901 Hamilton Ave. Cleveland 14, Ohio



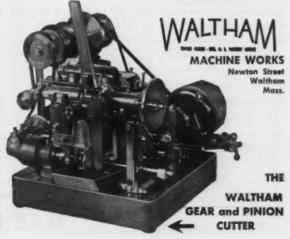




SMALL GEAR AND PINION PRODUCTION THAT'S

Automatic!

Automatic loading and unloading feature elimingtes lost motion in producing accurate small diameter, fine pitch gears and pinions on the Waltham, Individual motor drive through step cone pulleys gives a wide range of feeds and speeds. Compact design takes up less than 4 sq. ft. on the bench. If you want accurate . . . fast . . . economical small gear production get full information.





"...business helps itself by promoting thrift among its own people."

EDWARD C. BALTZ

President
Perpetual Building Association
Washington, D. C.

"Expanding the regular sales of U. S. Savings Bonds is essential to the continued success of our Government's sound money policy. Savings Bonds help people build security for themselves and stability for the nation's economy. A reserve in Bonds gives them the assurance to spend current income on homes, cars and other substantial purchases. Meanwhile, regular Bond buying goes on adding to their future buying power. Thus business helps itself by promoting thrift among its own people. The surest way to encourage an employee to save regularly right where he works is to sign him up on the Payroll Savings Plan."

Let's point up this statement by Mr. Baltz, head of one of the nation's outstanding thrift institutions and volunteer chairman of the District of Columbia Savings Bond Committee, with a few facts and figures:

- currently, more than 45,000 companies, large and small, representing every classification of industry and business, are encouraging national thrift through the Payroll Savings Plan.
- every month, 8,500,000 Payroll Savers in these 45,000 companies invest more than \$160,000,000 in Savings Bonds.
- largely as the result of employer-encouraged thrift the cash value of Savings Bonds held by individuals on July 31, 1954, totaled more than 37.5 billion dollars.

- never before has America had such a reserve of future purchasing power.
- invested in America, these 37.5 billion dollars in Savings Bonds Dollars are a most effective check on inflation and a very important contribution to economic stability and a sound dollar.

A million new Payroll Savers by the end of 1954! That's the goal of those who believe that what is good for Americans is good for business. To do your part in reaching this objective, phone, wire or write today to Savings Bonds Division, U. S. Treasury Department, Washington, D. C. Your State Director, U. S. Treasury Department, will show you how easy it is to build a successful Payroll Savings Plan.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

MACHINERY







GEARS

Specifications

You and we can form a team-you to draw up the specification; we to make the gears—that will be profitable to both of us. Gears of all types, all sizes, all materials. Design-engineering service available.

> **Custom Gears** Exclusively

DIEFENDORF GEAR CORPORATION

Syracuse 1, N. Y.

SPECIALISTS 30 years of customer WOODRUFF GIB HEAD satisfation based on TAPERED FEATHER a superior product, SPECIAL reasonable pricing, delivery dependa-bility, and company reliability.

GARDEN CITY

Always able to satisfy another customer.

Write for literature STANDARD AUTOMOTIVE PARTS COMPANY

ALSO Special Shapes machined from cold draws

WRITE NOW FOR FREE COPY OF FASTENER MANUAL P14

ALLMETAL SCREW PRODUCTS COMPANY, INC.

NEW YORK

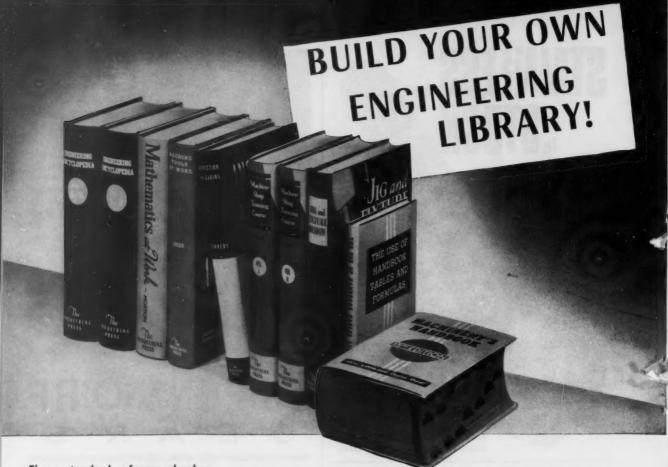


SOMETHING NEW FOR SECOND OPERATION KNAPP COLLET & CHUCK STOP

Pieces up to 16" long accommodated by Knapp stop installed in conventional 1" collet capacity lathe. Locks in draw tube, not collet; may be set in 30 seconds. Locking surface of serrated collet segments 1" long x draw tube I.D. Will not slip. Fits automatics-engine-turret lathes having .320 to 4" I.D. tubes. 30 day free trial welcomed.

B. L. KNAPP INDUSTRIES Syracuse 4, N. Y.





These standard reference books, written and compiled by outstanding authorities, provide a library of engineering information without equal! Order by number the ones you need to start your library of technical information, and have the right answers to engineering and production problems at your fingertips. Note Five-Day Free Inspection Offer in the coupon below.

- 1. MACHINERY'S HANDBOOK-The indispensable reference book of the mechanical industries, covering the latest developments in engineering standards and shop practices, in addition to math tables, rules, formulas and general data. 1911 pages, thumb indexed, \$9.00 Postpaid in U.S. In Canada or overseas \$10.00
- 2. THE USE OF HANDBOOK TABLES AND FORMULAS—Shows you how to get the most out of MACHINERY'S Handbook. Examples, solutions and test questions enable the user to obtain information

quickly. Excellent for shop training courses. 203 pages, 63 illustrations.

\$1.50 Postpaid in U. S. In Canada or overseas \$1.60

- 3. ENGINEERING ENCYCLOPEDIA Condensed and practical information on mechanical laws, rules and principles; physical properties of materials; features and functions of machine tools, and many other subjects. Two volumes, 1431 pages, 206 drawings, Postpaid in U.S. In Canada or overseas \$11.33
- MATHEMATICS AT WORK—A compre-hensive problem-solving guide written especially to show how arithmetic, algebra, geometry, trigonometry and logarithms are applied to the metal-working field. 728 pages, 196 illustra-\$7.00

Postpaid in U.S. In Canada or overseas \$7.94

5. MACHINE TOOLS AT WORK-A selection of machine shop operations illustrating the application of standard and machine tools to outstanding jobs. Data are given on speed, feed, production, etc. 584 pages, 434 illus trations, \$6.00 Postpaid in U.S. In Canada or overseas \$6.97

6. INSPECTION AND GAGING-Covers methods of inspection and their uses, types of equipment and how to use it, duties of inspection personnel. Indispensable for training courses, supervisors, plant and quality control engineers. 512 pages, 317 illustrations,

Postpaid in U.S. In Canada or overseas \$8.40

7. MACHINE SHOP TRAINING COURSE-The most complete existing treatise on machine shop practice and allied subjects. For shop training courses, as well as shop men and designers who want to add to their practical knowledge. volumes, 1124 pages, 572 illustrations,

\$8.00 Postpaid in U.S. In Canada or overseas \$9.29

8. JIG AND FIXTURE DESIGN-A comprehensive treatise covering the principles of development and the important design and constructional details of all classes of jigs and fixtures. 382 pages, 327 illustrations, \$4.00 327 illustrations, \$4.00
Postpaid in U.S. In Canada or overseas \$4.86

CHOOSE YOUR MOST CONVENIENT METHOD OF PAYMENT

- I enclose check or money order covering payment in full for books checked at right. (Note prices applying to foreign orders.)
- Send books under Five-Day Free Inspection Plan. If I decide to keep books
- | will send payment within five days.
 | Bill me. | Bill company.
 | Please send details of your Time Payment Plan covering the books I have

THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N.Y.

Please send me the books whose numbers I have circled, under the terms checked at the left.

5 6 7

City Zone State M11/54





Made of finest high speed steel. Available in all standard sizes. Always in steck for immediate delivery. Specials made to your specifications.



CENTER REAMERS

High speed steel. Reamers from ½" to 1" regularly fur-nished with 60°, 82° or 90° included engle. Specials made to your specifications.



LATHE MANDRELS



istrated literature and prices on all KEO Products mailed on request.

steel, hardened and occurately ground. Tapered .0005" to the inch. Mandrels from 3/16" to 1" are .0005" undersize at small end, from 1-1/6" to 3", .001" undersize. Immediate delivery.

CUTTERS KEO 19324 WOODWARD







LUERS

PATENTED CUTTING OFF TOOL HOLDERS PATENTED CUTTING OFF BLADES

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

J. MILTON LUERS, 12 Pine Street, Mt. Clemens, Mich.



STOCKED in many lengths and diameters; extremely accurate; milled from bar stock, also centerless ground. Standard Taper Pins made from B-1113 steel; also available in all other metals. Write for catalog and samples

or send your blueprints for quotation.

ohn Gillen Company

25645 S. SOTH. AVE., CICERO 50, ILLINOIS

GROOVE PINS - MACHINE KEYS - TAPER PINS - MACHINE PARTS - WOODRUFF KEYS

The VIKING LINES are COMPLETE!

for:

LUBRICATING PUMPS

Pumps built for bearing lubrication service up to 500 psi handling lubricating oils. Ask for free bulletin 1803J.



1/2 To 31/2 G.P.M.

COOLANT PUMPS

Viking coolant pumps feature the relief rotor . . . no bypass needed. Handy port location. Just turn casing in bracket to fit your piping. Ask for free bulletin 1100J.



To 35 G.P.M.

HYDRAULIC PUMPS

Suitable for pressures up to 500 psi on hydraulic oils, intermittent service, 250 psi



Ask for free bulletin 3031.



5 To 200 G.P.M.

PUMP COMPANY Cedar Falls, lowa

Classified and Re-Sale Section

eastern Rebuilt Machine Tools THE SIGN OF QUALITY-THE MARK OF DEPENDABILITY

MULTIPLE SPINDLE DRILLS

3 spindle 24" Barnes All Geared Self-Oiling, m.d.
#115U Moline Multiple Spindle Drill Press
No. 3 Baush, m.d. 18320", head
No. 18 Baush, m.d. 18320", head
No. 18—Foote-Burt Firsted Center, m.d.
3 spindle Rockford Gang Drill, m.d.
3 spindle Self Cincinnati-Bickford Upright Drill, m.d.,
No. 4 Morse Taper
4 spindle Niles-Bement-Pond, m.d., 12" rail, No. 5 Taper
No. 924 W. F. & John Barnes Vertical Drilling, Boring,
Facing & Reaming Machine
6 spindle W. F. & John Barnes Vertical Drilling Machine
ditier, m.d.
Leland & Gifford Multiple Spindle Upright Drill, m.d.

UPRIGHT DRILLS

D4 Colburn, m.d.
D6 Colburn Heavy Duty, m.d.
20" Cincinnati-Bickford Super-Service Production Drill,

24" Aurora, m.d. 24" Cincinnati-Bickford, m d.

24° Cincinnati-siectord, in d.
26° Autora, m.d., taper
22° Autora, belt drive
32° Autora, belt drive
No. 2 Colburn Mfg. Type, m.d.
No. 315 Baker Heavy Duty, s.p.d.
No. 417 Baker, m.d., later type
No. 513 Baker, m.d. o. Drill, m.d.
#4-48° Defiance Machine Co. Drill, m.d.

GEAR SHAPERS

GEAR SHAPERS

12 Fellows Gear Shaving Machine, m.d., late
6 Fellows, belt drive
17 7A Fellows, belted, m.d.
18 Fellows, Gear Finishing Machine, m.d.
18 Fellows, Gear Forsishing Machine, m.d.
19 Fellows, gear box, m.d.
10 Fellows, m.d.
10 Fellows, m.d.
10 Fellows, m.d.
10 Fellows, m.d.
11 Fellows, m.d.
12 Fellows, m.d.
14 Fellow Gear Generator, m.d.
15 Fellows, m.d.
15 Fellows, m.d.

GEAR CUTTERS

Gleason Spiral Bevel Gear Rougher, m.d.
No. 3.—36" Brown & Sharpe Gear Cutter
No. 4B Fellows Gear Burnisher
No. 8B Fellows Gear Burnisher
No. 8B Fellows Gear Burnisher
3" Gleason Gear Generator, m.d.
8" Gle-son Gear Generator, m.d.
11" Gleason Straight Bevel Gear Generator, m.d.
Clincinnati Gear Burnisher, m.d.
No. 12 Gleason Straight Tooth Bevel Gear Bougher, m.d.

GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur & Helical
No. 13L5 Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine, m.d., latest
GG31 Gear Grinding Machine, Internal Gear & Spline
Grinder, m.d.

GEAR HOBBING MACHINES 120H Gould & Eberhardt Double Head Universal,

Tatest

Istest

Istest

Reverse of the Commun. m.d.

No. 5 AC Lees-Bradner Heavy Type Gear Generator, m.d.

No. 12 Barber-Colman Double Gverarm, m.d.

No. 12 Barber-Colman Single Gverarm, m.d.

No. 34 Brown & Sharpe, m.d.

No. 44 Brown & Sharpe, m.d., Spur & Spiral

GEAR TESTERS

No. 1 Brown & Sharpe Spur Gear Tester 12" cap. National Broach & Machine Co. 18" National Broach & Machine Co. 18" Gleason Bevel Gear Tester, m.d. No. 471 Michigan Tool Co. Hob, Reamer, & Gear Checker

AUTOMOTIVE GRINDERS

Kwik-Way Model H Piston Turning & Grinding Machine, m. d., late No. 76 Van Norman Automatic Piston Turning & Grind-ing Machine, m.d., late

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d. No. 3 Cincinnati, m.d. Cincinnati Valve Seat Grinder, cap. %" valve stems, m.d.

EMERY GRINDERS

3 H.P. Baldor Emery Grinder, pedestal type #516 Mummert & Dixon Badial Emery Grinder, m.d., 5 H.P. motor No. 44 Excello Double End Carbide Grinder, m.d.

CRANKSHAFT GRINDERS

18x66" Landis Universal, type C, m.d., late 22"x72" Landis Type CH, m.d., late

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindles No. 55 Heald, m.d. No. 73 Heald Airplane Cylinder Grinder, m.d., new Model FG Micro Cylinder Grinder, m.d. No. 78 Heald Centeries Cylinder Grinder, m.d.

ABOVE ONLY A PARTIAL LISTING—SEND FOR COMPLETE STOCK LIST

EASTERN MACHINERY COMPANY

MANUFACTURERS

Are you represented in Oakland and Macomb Counties, Michigan? We are situated in the center of this new and rapidly expanding industrial area north of Detroit. We are a reputable dealer with 25 years experience in selling new and used machinery, and are interested in the representation of new machine tools and accessories. We invite your correspondence.

R. A. VINE, INC.

120 E. Hudson Avenue Royal Oak, Michigan

"LATE MODEL MACHINE TOOLS"

CRINDERS. CENTERLESS, No. 2 Cincinnati Filmatic (2) 1942-1943.

GRINDERS. TOOL & CUTTER. No. 2 Cincinnati universal, 1942.

GRINDERS. CYLINDRICAL, 4" x 18" Cincinnati Plain hyd., 1945.

GRINDERS. CYLINDRICAL, 10" x 18" Cincinnati ER plain hyd., 1946.

GRINDERS. CYLINDRICAL, 16" x 72" Norton C, wing 26", new 1945.

GRINDERS. CYLINDRICAL, 16" x 96" Landis type B, GRINDERS. CYLINDRICAL, 16" x 96" Landis type B, GRINDERS. SUBFACE, 14" x 36" Pratt & Whitney vert. spd., 1942.

GRINDERS. SUBFACE, 43" No. 16A2 Blanchard rotary, new 1947. GRINDERS, SURFACE, 43" No. 16A2 Bianchare rotary, new 1947.
GRINDERS, SURFACE, 72" No. 72 Hanchett rotary, new 1946.
LATHES, ENGINE, 16"/28" x 5' bod Smith Drum, gap, new 1945.
LATHES, ENGINE, 14" x 6' bod Hondey toolroom, Timken, 1940. LATHES, ENGINE, 24" x 14' bed American solvetive G.H., rebuilt. LATHES, ENGINE, 52" x 30' bed H-B-P enclosed LATHES, ENGINE, 52" x 30" bed N-B-P enclosed G.H. like new.
LATHES, TURRET, No. 5 Jones & Lamson universal (2), 1939.
LATHES, TURRET, 36" and 42" Bullard New Era vertical.
MILL, 24" x 24" x 12' Ingersoll adj. rail, tracer, new 1945.
MILL, Nos. XK and 4K Kaarney & Trecker, rebuilt. Nos. PRESS, 30 to UA43 Mispara adj. Knoe, sunch. 1941.
PRESS, 56 ton No. 304 Bits a.s., new 1942.
PRESS, 50 ton No. 1042 Verson s.: "all steel."
PRESS, 400 ton No. 663 Tolede kneekle joint.

ALSO 1000 OTHER GOOD MACHINE TOOLS

MILES MACHINERY COMPANY

2045 E. Genesee Ave. ephone—Saginaw 2-3105 SAGINAW, MICHIGAN



The world's best . . . one-piece, drop-forged—not welded— of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nst, Sizes: up to 30". Typical direct priess for 10" hengths: %—\$1.36; %—\$1.36; %—\$1.58; %—\$1.89. Write for price list. THE O K TOOL COMPANY, INC., MILFORD 6, N. H.

MACHINE TOOLS

4' x 15" col. CARLTON Motor on the Arm Radial 48 Spindle Speeds, 15 to 1500 RPM, A.C. M.D. Box table, coclant system, 1943.

FALK MACHINERY CO.

18 Word Street - BA 5887 - Rochester, N. Y.

DESIGN AND SALES ENGINEERS

Internationally known manufacturer of machine tools located in Chicago has excellent opportunities for design engineers and sales engineers with experience on pneumo hydraulic boosters, accumulators, solenoid air and hydraulic valves. Good starting salary and future. Send resume of education and experience. Box No. 686, MACHINERY, 148 Lafayette St., New York 13, N.Y.

o.T

us like this! * Patent No. 2,512,033 like this! NU-TANGS INC

Sond them to

broken-tools made like new again with NU-TANGS

costs on any tool with a Morse Taper (sizes 1 to 6) Hundreds of leading industries save money on drills, reamers, countersinks, cutters, drivers, the NU-TANG way.

Prompt delivery. Send for price-mor send tools for rapairs. All work guaranteed.

NO WELDING! NO SLEEVES!
NO SHORTENING! NO DISTORTION!
GUARANTEED
STRONG AS MEW!
We return the

Twisted or broken tangs replaced at le

ELECTRIC FURNACE TO 1850°

with Auto Temperature Control. Sliding door. Cheap to operate. Substantial Dependable for Machine Shop, Tool Room.

8" x 12" x 15" Inside 4.5 K.W. \$250.00 12" x 16" x 20" inside 9.0 K.W. \$500.00

E. H. WILLIAMS BOX 9042D, HUNTINGTON, W. VA.

MACHINE TOOL RECONDITIONING & the Art of Hand Scraping

-Illustrated-

Write today for folder describing book MACHINE TOOL PUBLICATIONS 215 Commerce Bldg., South Wabash St. St. Paul 1, Minn.

HELP WANTED

CONTROL PRODUCTS, INC. SUSSEX ST. HARRISON, N.J.

ENGINEERING ENCYCLOPEDIA

This two-volume work of reference is for everyone who can use the essential facts about thousands of standard and special engineering subjects. It consists of clearly written concise treatises, definitions of numerous terms used in engineering and manufacturing practice and the results of many costly and important tests and experiments - in brief, 1431 pages of useful facts for all engaged in any kind of mechanical work.

Price, \$10 set.

THE INDUSTRIAL PRESS

148 Lafayette Street New York 13, N. Y.

· Are there any machines or equipment you need, or would like to sell? Advertisements in MACHINERY'S Classified and Re-Sale Section bring results! Rates are \$10.00 per singlecolumn inch. Send payment with

Classified Advertising Department

MACHINERY

148 Lafayette Street New York 13, N. Y.

For Immediate

Late model Williams & White 3.000 Ton Down-Moving Hydraulic Press in excellent condition. Now in operation. Available for prompt release. Priced as is and where is in our Kansas City plant.

Price . . . \$110,000

Specifications:

Triple Action Hydraulic Press-Serial No. C-1407 Total Weight-350,000 Lhs. 200 HP 400 V Syn. Meter Oilgear Pumps 3000# Pressure 4 Station Control 700 Ton Blank Holder 600 Ten Die Cushion Size Of Ram and Bed-105" F. to B.-175" Distance Between Posts-65" x 110" Daylight Opening-100%"
Equipped With Diebolster 34%" High Daylight With Beister-661/4" Blankholder Travels 36" Die Cushion Travels 18" Speed Up-300" Speed of Ram—Ne Lead—450" p.m. Speed of Ram—Ne Lead—17" p.m. Overall Height Above Floor—28' 5"

Clearing Double Acting Press, Model 4350-132, in A-1 condition. A twin of this press is in operation and can be inspected at work. Priced f.o.b., loaded on cars, our Kansas City plant—a \$55,000 real buy at

Specifications:

Depth Below Floor-6' 0"

Double Action Press-Serial No. 46-11976-P 40 HP 440 V Meter 350 Ton Ram Pressure 2 Cushions-61 Tons Each Stroke 12" Slide Stroke 24"-Adjustment 24" Strokes 10 P.M. 127" Between Gibs 134" Between Uprights 26" From Bed To Bottom Of Gib Daylight Stroke Down Adjustment Up 48" Bed Area—FB 80" RL 134" 2 Openings In Bed for Cushion 60" x 531/2" Bolster 8" Floor Area-6' 8" x 14' 9" Height Floor To Top Of Press-21' 8" Lubricating Motor 1/4 HP Adjustment Motor 3 HP Main Ram Motor 40 HP Weight-35.500 Lbs. Ram 2,000 Lbs. Small Parts 26,000 Lhs. Side Frames 78,200 Lbs. Crown And Motor Balancers

75,900 Lbs. Base (Complete)

TOTAL-216,000 Lbs.





Write, Wire or Phone: Director of Purchases

SAVE 90% WIEDEMANN



The RA-41P Turret Punch Press Pays for itself in 2 YEARS or LESS

Save 90% on PIERCING

- Unmatched for high speed, low cost duplication of intricate hole patterns in flat sheet metal—low to medium production quantities.
- 18 or 20 punches and dies in turrets ready for use.
- Hole locations are made to a color-coded template—50 or more holes per minute.



Save 90% on TEMPLATE MAKING

- Press can be supplied with optical dimensioning instruments for template making.
- These templates are used with the RA-41P as well as for other applications.
 Drill jigs, prototypes, etc. are also produced to a tolerance of ±.002" in 10% of the time usually required.



Wiedemann ships each press tooled—ready to produce your parts as soon as the machine is leveled and connected to your power line.

Wiedemann engineers will be pleased to study your drawings and show how these savings can be yours.

Write for a copy of Bulletin 241

WIEDEMANN MACHINE COMPANY

4205 Wissahickon Avenue, Philadelphia 32, Pa.

	AT DITA DETICAL INDE	V OF ADVEDTICEDS	
	ALPHABETICAL INDE	Electrons, Inc 346	Incereal Milling Washing
Λ	Cincinnati Gear Co	Ellstrom Standards Div.	Co
Abrasive Machine Tool Co. 78-79	Co	Elmes Engrg. Div. American	innois dear a machine Co. 393
Ajax Mnaufacturing Co 40-41	Co 6-7 (Insert bet. 44-49)	Steel Fdries 281	J
Allegheny Ludlum Steel Corp. 290	Cincinnati Milling Machine Co., Hydroform Div 75	Elox Corporation of Michigan 359	Jacobs Manufacturing Co 73
Allen, Alva F	Cincinnati Milling Products Div., Cincinnati Milling	Espen-Lucas Machine Works 425 Etteo Tool Co., Inc. 33	Jahn, B., Mfg. Co
bet. 140-143	Machine Co	Ex-Cell-O Corporation 278-283	Jones & Lamson Machine Co
Allmetal Screw Products Co. Inc. 439	Cities Service Oil Co 349	F	
Amco Gage Co 411	Classified Advts 442-443	T : C 11 M f t i C 410	K
American Broach & Mch. Co. Insert 93-108	Clearing Machine Corp. Back Cover	Fairfield Manufacturing Co. 410 Falk Machinery Co. 442	Kaufman Mfg. Co 433
American Felt Co 294	Cleereman Mch. Tool Co. 60-61	Farrel-Birmingham Co., Inc. 347	Kearney & Trecker Corp. 16-17
American Schiess Corp 379	Cleveland Crane & Engrg.	Federal Machine & Welder Co. 380	Keller Tool Co
American Steel Foundries	Cleveland Grinding Machine	Federal Press Co 74	Keo Cutters 441
American Tool Works Co 147	Co. 339 Cleveland Instrument Co. 364	Federal Products Corp. 344-345 Fellows Gear Shaper Co 4-5	King Mch. Tool Div. American Steel Fdries 293
Ames, B. C., Co	Cleveland Punch & Shear	Ferracute Machine Co 426	Kingsbury Mch. Tool Corp.
Insert 93-108	Wks. Co. 403	Firth Sterling, Inc. 327	Knapp, B. L. Industries 439
Armstrong-Blum Mfg. Co 333 Armstrong Bros. Tool Co 150	Cleveland Tapping Machine	Fischer Machine Co. 435 Foote-Burt Company 50	Knapp, D. L. Industries 409
Atkins Saw Div., Borg	Cleveland Twist Drill Co.	Formsprag Co 391	L
Warner Corp 330 Automatic Steel Products,	Colonial Broach Co 361	Fulmer, Allen C., Co., 376	L & J Press Corp 386
Inc 348	Columbia Div.,	G	Lake Erie Engineering Corp.
Avey Drilling Machine Co 305	The Lodge & Shipley Co. 312 Columbus Die-Tool & Mch.	Gairing Tool Co 382	Landis Machine Co 2-3
Axelson Manufacturing Co. 51	Co	Gallmeyer & Livingston Co. 416	Landis Tool Co 10-11
В	Cone Automatic Mch. Co.,	Gardner Machine Co. 23-39 Gear Grinding Machine Co. 398-399	Le Blond, R. K., Machine
Baker Bros., Inc 337	Inc. 72 Consolidated Machine Tool	General Electric Co. 135-334-335	Tool Co
Baldwin-Lima-Hamilton Corp. 76-77	Corp 28-29	Giddings & Lewis Machine	Leland-Gifford Co 82
Ball & Roller Bearing Co437	Continental Tool Wks. Div. of Ex-Cell-O Corp. 283	Tool Co	Lincoln Electric Co
Barber-Colman Co. Insert 93-108 Bardons & Oliver Inc 64-65	Cross Company 270	Gisholt Machine Co.	Union Carbide and Carbon
Barnes Drill Co Insert 93-108	Crucible Steel Co. of America 113-115	(Insert bet. 32-33) Gleason Works	Corp. 36 Link-Belt Co. 22
Barnes, John S., Co.	Cumberland Steel Co 122	Gorham Tool Co 336	Lowe Bros. Co 152-153
Insert 93-108 Baush Machine Tool Co 307		Gorton, George, Mch. Co 404 Goss & DeLeeuw Mch. Co 342	Luers, J. Milton 441
Bethlehem Steel Co 111-120	D	Grant Mfg. & Machine Co 435	M
Bilgram Gear & Mch. Wks. 421 Black, Sivalls & Bryson, Inc. 443	Danly Mch Specialties,	Gray, G. A., Co 143	M.
Blanchard Machine Co 90	Inc 84-85-321	Greenlee Bros. & Co. Insert 93-108	Machinery Insert bet. 294-295
Bliss, E. W. Co 70-71 Boston Gear Works 407	Davis Boring Tool Div. Giddings & Lewis Mch.	Greenfield Tap & Die Corp.	Madison-Kipp Corp 308 Materials Section 109-124
Braun Gear Co	Tool Co 138	Geometric Tool Co. Div. Insert 91	Mattison Machine Works
Brown & Sharpe Mfg. Co. Insert 255-256	Davis Keyseater Co		Insert 93-108 Metal Carbides Corp. 439
Bryant Chucking Grinder Co.	DeLaval Separator Co 371	H	Miles Machinery Co 442
42-43-295	Delta Power Tool Div. Rockwell Mfg. Co. 285	H. E. B. Machine Tools, Inc. 315	Millers Falls Co 400 Millholland, W. K.,
Bryant Machinery & Eng.	Denison Engineering Co 431	Hanchett Magna-Lock Corp. 394 Hannifin Corporation 390	Machinery Co 368
Buffalo Forge Co 292	Detroit Broach Co	Hardinge Brothers, Inc 156	Mitts & Merrill
Buhr Machine Tool Co 263 Bullard Co. Insert 34-35-384-385	Detroit Reamer & Tool Co. 313 Detroit Tap & Tool Co. 401	Hartford Special Machinery Co	Modern Mch. Tool Co 370 Moline Tool Co
Butterfield Div.,	Diefendorf Gear Corp. 439	Harvey Mfg. Corp. Sub. of	Moore Special Tool Co., Inc. 54
Union Twist Drill Co 83	DoAll Company	Germanow-Simon Mch. Co.	Morris Machine Tool Co 373 Motch & Merryweather
С	Dykem Co. 441	Inc. 436 Haynes Stellite Co. Div., Union Carbide & Carbon	Mchry. Co
Carboloy Dept. of General	E	Corp. 112	37
Electric Co	Eastern Mch. Screw Corp 445	Heald Machine Co. Inside Front Cover	N
Card, S. W. Mfg. Co. 415	Eastern Machinery Co 442	Hill Acme Co 68	National Acme Co 37-49
Carlton Machine Tool Co. 86-87	Eastman Kodak Co 309	Hyatt Bearings Div., General Motors Corp. 59	National Automatic Tool Co.
Carpenter Steel Co 124 Challenge Mchy. Co 340	Eaton Manufacturing Co., Reliance Div	Hydraulic Press Mfg. Co. 310-311	Inc. 132-133 National Broach & Mch. Co. 331
Chambersburg Engrg. Co 56	Eclipse Counterbore Co 432		National Forge & Ordnance
Chicago-Latrobe Twist Drill Wks. 358	Edlund Machinery Co 435 Eisler Engineering Co., Inc. 435	Ť	Co



Ekstrom-Carlson & Co.



Insert 93-108 Industrial Press - 419-434-440

Industrial Filtration Co. 355

IMPROVE FACING OPERATIONS

National Tool Co.
National Tube Div., U. S.
Steel Corp.

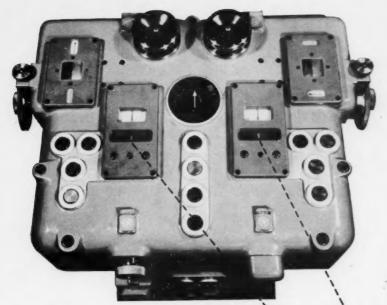
ON BORING MILLS - DRILLS - LATHES MILLERS AND RADIALS

M-D facing Head feeds automatically. Lathe tool bit travels radially from center outward or reverse. 10 sizes, 6" to 46" dia. Write for bulletin, prices.

MUMMERT-DIXON CO. 126 Philadelphia St. HANOVER, PA.

National Twist Drill & Tool	Ransburg Electro-Coating	Skinner Chuck Co 388	Union Twist Drill Co 393
Co	Согр 320	Smit, J. K., & Sons, Inc 396	United States Drill Head Co. 298
New Britain Mch. Co., The	Rehnberg-Jacobson Mfg. Co.	Snow Mfg. Co 397	United States Steel Corp.
Insert bet. 124-125	Insert 93-108	Snyder Tool & Engrg. Co 261	116-117-119
New Departure Div. General	Reid Bros. Co., Inc 402	South Bend Lathe Works 304	Universal Engineering Co 375
			Used Machinery 442-443
Motors 287	Reliance Div., Eaton Mfg.	Springfield Machine Tool	Caca Machinery
New Jersey Gear & Mfg. Co. 436	Co	Co. 302-303	v
New Jersey Zinc Co 114	Reliance Electric & Engi-	Stahl Gear & Machine Co 437	V
Niagara Machine & Tool	neering Co 369	Standard Automotive Parts	
Works 88-89	Republic Steel Corp 288	Co 439	Vanadium-Alloys Steel Co 381
Nice Ball Bearing Co 148	Revere Copper & Brass, Inc. 273	Standard Gage Co., Inc. 92	Van Keuren Co 126
Nichols-Morris Corp 341	Richard Bros. Punch Div.	Standard Oil Co 316-317	Van Norman Co 8-9
Norma-Hoffmann Bearings	Allied Products Corp 343	Standard Pressed Steel Co. 44	Verson Allsteel Press Co 429
Corp	Rivett Lathe & Grinder, Inc. 329	Starrett, The L. S., Co 276	Vickers Incorporated 413
Norton Company 14-15-62-63	Rockford Clutch Div. of	Sun Oil Co 275	Viking Pump Co 441
	Borg-Warner 372	Sunstrand Machine Tool	Vinco Corp. 324
0	Rockford Machine Tool	Co Insert 93-108	vinco corp.
OVER 10 V	Co Insert 93-108	Supreme Products, Inc 338	4
O K Tool Co., Inc. 442	Rockwell Manufacturing Co.	Swanson Tool & Mch.	W
Oakite Products, Inc 118	(Drill Unit Div.) 149	Products, Inc 357	
Ohio Crankshaft Co 69	Rockwell Mfg. Co.	Troducts, The.	Waldes Kohinoor, Inc 314
Oilgear Co 319	Delta Power Tool Div 285	The state of the s	Walker, O. S., Co., Inc 362
Oliver Instrument Co 414	Rollway Bearing Co., Inc 297	1	Walls Sales Corp 436
Olsen, Tinius Testing	Ross Operating Valve Co 269	m c D : 355 G 140 000	Waltham Machine Works 437
Machine Co 406		Taft-Peirce Mfg. Co 146-306	Warner & Swasey Co 24-25
Onsrud Machine Works, Inc. 353	Rowbottom Machine Co 433	Texas Company 154	Wesson Company 296
Orban, Kurt, Co., Inc 379	Ruthman Machinery Co 420	Thompson Grinder Co 405	Wesson Metal Corp 296
Inside Back Cover	Russell, Holbrook & Hender-	Timken Roller Bearing Co.	Wheelock, Lovejoy & Co.,
Osborn Mfg. Co 423	son, Inc 291	Front Cover	
Ottemiller, William H., Co. 430	Ryerson, Joseph T. & Sons,	Timken Roller Bearing Co.	Inc
7 main 21., Co. 400	Inc. 158	(Steel & Tube Div.) 109	Wiedemann Machine Co 444
P		Tomkins-Johnson Co 140	Williams, J. H. & Co 360
	S	Torrington Co 32	Williamson Gear & Mch. Co. 436
Pangborn Corporation 446		Tuthill Pump Co 412	Winter Brothers Co 18
Perkins Mch. & Gear Co 392	Sales Service Machine Tool	Twin Disc Clutch Co 408	
Philadelphia Gear Wks., Inc. 127	Co		v
Pittsburgh Gear Co 328		TT	:
Pittsburgh Plate Glass Co. 411	Schrader's, A., Son,	U	
Pope Machinery Corp 289	Div., Scovill Mfg. Co 377	W C C 1 C 1 D:	Yoder Company 30
Potter & Johnston Co 151	Scherr, Geo., Inc. 437	U. S. Steel Supply Div.,	
Pratt & Whitney Div.	Scott Paper Co 300-301	United States Steel Corp. 123	Z
Niles Bement Pond Co 351	Scully-Jones & Co 136-137	U. S. Tool Company, Inc. 12-13	24
	Seneca Falls Mch. Co 144-145	Union Carbide & Carbon	
Procunier Safety Chuck Co. 436	Sheldon Machine Co., Inc 374	Corp., Haynes Stellite Co. 112	Zagar Tool, Inc 299
R	Shore Instrument & Mfg.	Union Carbide & Carbon	CI ACCIPIED CECTION
A.	Co., Inc 430	Corp., Linde Air Products	CLASSIFIED SECTION
R and L Tools 53	Simonds Abrasive Co 365	Co. Div 36	See pages 442-443





most revolutionary advance in precision hole location since the jig borer-

LINDNER, AUTOPOSITIOI

Now operator can speed up initial table settings-preselect exact table position for next hole while one boring operation is in progress-

do it consecutively, accurately for each hose in workpiece.

You soon see the difference in faster initial table settings, guaranteed accurate within .00015". In increased jig boring production, too-with the preselective Autopositioner available only on the Lindner LB15 Optical Jig Borer.

Non-productive time is practically eliminated. As one hole is completed, a push button unlocks the 44" x 24" table for rapid traverse (up to 40" per min.) movement in both directions to next preselected position. A few seconds for fine adjustment, then table is automatically locked in position and boring operation begins. Optical projection system permits exact centering-minimizes operator error and fatigue.

Direct-reading micro-optical measuring system is permanently free of wear...only a light beam touches it. No lead screws-therefore no back lash. Hole location may be approached from any position from either direction. Speeds and feeds are infinitely variable-spindle speeds range 25-1900 r.p.m.; milling feeds 1"-3" with power up-feed of spindle for fine finishing of bored holes.

Add to this, rugged single column construction for heavy roughing without affecting fine precision performance, and unusually deep throat for large, bulky workpieces-and you'll see why so many important toolrooms which measure precision in extremely close limits, now use one or more Lindners. Write for complete specifications on LB15 and smaller LB14 models.



SEE AUTOPOSITIONER AT WORK WRITE FOR MOVIE FILM

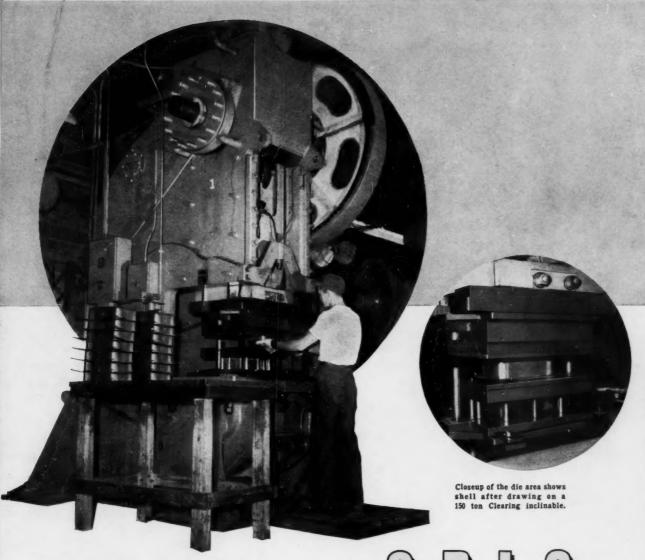


This 20 minute film takes you through design, manufacture and operation of the Lindner Jig Borer - demonstrates how Autopositioner combined with unique micro-optical measuring system makes the Lindner today's most advanced jig borer. It answers many of your questions. Lindner users will fill in the rest.



34 Exchange Place, Jersey City, N. J.

Toolroom and production machine tools for precision milling, boring, turning, drilling, grinding, hob grinding, gear testing.



deep draws on an O.B. I. ?



DayBrite Lighting, Inc. in St. Louis, Missouri, found the right solution to drawing EXIT sign shells with this 150 ton Clearing inclinable press. The press is

equipped with a die cushion providing blankholding pressure for the draw and stripping pressure to

remove the shell. Like all Clearing inclinable presses, the slide permits the use of dies which are larger than the slide area itself.

A press like this 150 ton Clearing will give you the capacity to do a truly remarkable range of jobs. Standard blanking and forming operations, of course, can be performed as well as the drawing operation in this same press.

If you want extra capacity in your shop for a wide variety of press operations, call on a Clearing engineer to find the most productive answer to your problem.



EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION . 6496 West 65th Street, Chicago 38, Illinois . HAMILTON DIVISION, Hamilton, Ohio